SAPCA

SPORTS AND PLAY CONSTRUCTION ASSOCIATION

The SAPCA Code of Practice for the Construction and Maintenance of Athletics Tracks

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The Sports and Play Construction Association

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The Sports and Play Construction Association (SAPCA) and UK Athletics do not accept any liability for the design or construction of any facilities, or the actions of any contractors employed, as a result of, or in connection with, any information provided in this publication.

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Introduction

The Sports and Play Construction Association (SAPCA) and UK Athletics have produced this document to provide prospective buyers and specifiers with guidance on the basic construction requirements and specifications currently employed in building athletics tracks and associated facilities with synthetic surfaces.

The document calls on the experience of SAPCA's member companies and UK Athletics who have constructed a wide range of installations for a variety of clients over many years. In addition, the requirements of the International Association of Athletics Federations (IAAF) and UK Athletics (UKA) (Rules and regulations) have been recognised in the preparation of this document. UK Athletics has been represented on the working group that has prepared this Code of Practice, which attempts to reflect the accepted best practice in the UK marketplace and to set a standard that is considered to be in the best interest of the sport in the UK.

Whilst it is not necessarily intended that this document should become part of a contract, it is hoped that it will prove useful in the selection of an appropriate system and surface, provide guidance to clubs and specifiers and form a useful reference in the design and construction process.

SAPCA and the National Governing Body recommend that experienced, professional consultants be appointed to provide the necessary level of expertise in designing and detailing sports facilities and ensuring compliance with all of the current legislation.

Notes to be read in conjunction with the Code of Practice

- This Code of Practice is intended for use by sports surfacing contractors, sports facility design professionals and athletics facility purchasers and owners. The Code of Practice should not be used as a substitute for carrying out appropriate surveys and obtaining professional advice in individual circumstances. Although the Code of Practice has been produced by reference to facilities constructed under normal climatic conditions in the United Kingdom, the Sports and Play Construction Association cannot accept any responsibility whatsoever for any loss, damage or injury whatsoever arising from reliance on the specifications within the Code of Practice.

- The Code of Practice provides a minimum standard of specification and proficiency which members of the Sports and Play Construction Association are committed to meet. As guideline specifications, however, these do not supersede a reasonable interpretation of the specification and terms of contract applying in each contract. For individual projects, variations in climate, soil conditions, topography and other site-specific conditions may necessitate standards of specification greater than those recommended within the Code of Practice.

- Parties not experienced in synthetic sports surfacing construction are strongly advised to consult qualified consultants and contractors with experience of track construction. The Sports and Play Construction Association can provide details of experienced track building consultants and contractors.

- Whilst the term ‘asphalt’ is the internationally accepted technical name for all surfaces that are composed of a mixture of bitumen and stone, this Code of Practice uses the generic term ‘bituminous macadam’, as this is still the commonly used name for asphalts within the UK.

- In accordance with common practice within the construction industry, the depth of any individual construction layer is specified within the Code of Practice as the nominal compacted depth. The nominal depth can be regarded as the design depth of a layer of construction within a track system.

- In the interests of clarity and consistency the minimum compacted depth is also specified, in order to define the tolerance on the design depth that is considered acceptable.

- It is intended that the consistent use together of the terms nominal compacted depth and minimum compacted depth, by contractors and consultants alike, will help to avoid any confusion when competitive quotations are being examined.

- The information contained within the Code of Practice, whilst accurate at the time of publication, may be subject to change at a future date. Due to changing technology, new developments in construction methods, and the changing requirements of the sport’s governing bodies, revisions to the recommendations are likely, and only the most recent edition of the Code of Practice should therefore be used.

- A permanent joint committee will keep under review the use of the Code of Practice and will consider any suggestions for amendment, which should be addressed to the Chief Executive, The Sports and Play Construction Association, Federation House,

National Agricultural Centre, Stoneleigh Park, Warwickshire, CV8 2RF. Revision to the Code of Practice will be made when it is considered appropriate.

- Due to the fact that many of the processes used in constructing synthetic sports surfacing systems are highly susceptible to weather conditions such as temperature, humidity, rainfall etc., it is advisable to check with the specialist contractor as to the most suitable time of year for the installation of his proprietary product.

Participating Organisations

The Code of Practice for the Construction and Maintenance of Athletics Tracks has been produced in consultation with the following organisations, and is recognised and supported by them as the minimum standard for the construction of athletics facilities in the UK.

- SAPCA
- UK Athletics (UKA)
- The Institute of Groundsmanship (IOG)

Please Note: *Users of the Code of Practice are advised to ensure that they are fully aware of any further technical requirements or criteria which may be imposed by a specific funding body for individual facility development projects.*

The Sports and Play Construction Association (SAPCA)

As the recognised UK trade association, SAPCA fosters excellence, professionalism and continuous improvement throughout the sports and play construction industry, in order to provide the high quality facilities necessary for the success of British sport.

SAPCA's Aims and Objectives

- To promote high standards of design, construction and workmanship for sports facilities in the UK.
- To regulate the industry through the vetting and monitoring of SAPCA members.
- To participate fully in the development of British, European and other Standards for the construction and performance of sports facilities, for all levels of play.
- To liaise closely with the governing bodies of sport, both nationally and internationally.
- To encourage the use of new technology in the design and construction of sports facilities.
- To provide and support training and education for the industry's workforce.
- To provide a strong voice for the sports construction industry in the UK.

www.sapca.org.uk

The SAPCA web site provides a wealth of valuable information for anyone involved in the development of sports facilities. Visit www.sapca.org.uk - for Industry News, Technical Guidance, Exhibitions & Events, the SAPCA Membership Database, and more. Visitors are invited to subscribe to the free SAPCA News Update service, for regular news bulletins.

Further information

The Sports and Play Construction Association operates through its own full-time administration. For further information, including a list of members, please contact SAPCA at the headquarters address below.

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UK Athletics (UKA)

UK Athletics is the Governing Body for Athletics in Great Britain and Northern Ireland and is recognised as such by the International Association of Athletics Federations (IAAF). UKA works with its partners – Governing Bodies and Sports Councils in the four home countries – to develop programmes and policies that are then delivered by the partner organisations.

UKA is responsible for the official track certification programme throughout the UK. See Section 1.11.

UK Athletics
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Web:	www.ukathletics.net

The Institute of Groundsmanship (IOG)

The Institute is the leading organisation that represents all those professionals involved in groundsmanship, greenkeeping, turf-culture and amenity management.

Formed in 1934, with branches throughout the British Isles, it is the only all-encompassing organisation for all those with a practical or commercial interest

in the sports turf, landscaping and amenity management industry. Its monthly journal 'The Groundsman' is the source of information on the industry.

The Institute's Training & Education Department develops and delivers courses either pre-arranged or on site to single clients and has the support and endorsement of the major governing bodies of sport. It also has links with the horticulture colleges within the British Isles.

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Acknowledgements

SAPCA would like to acknowledge the assistance from many people who contributed towards the production of this code of practice. People who suggested topics, sections and information combined with those who commented on technical issues during the consultation phase. There are too many to name individually but our deepest gratitude goes to all of them without your help and support this document would not have been possible.

Prologue

From the first considerations regarding the construction of an athletics track through to the final completion, a clear understanding is required of the process. The processes and decisions that need to be made can be complex and will depend upon many contributing factors.

This code of practice has been split up into two main sections that cover the construction and maintenance requirements associated with athletics tracks.

The first section focuses on construction requirements that should be considered during the construction phase of an athletics track:

- General Design Considerations
- Earthworks
- Drainage
- Sub-base Construction
- Base Construction
- Types of Synthetic Surfaces
- Testing
- Fencing

The second section of this document focuses on the maintenance requirements for the track itself and equipment associated with the track and field events. Maintenance procedures are detailed for the track along with the benefits they will bring to the life expectancy and performance of the track. The maintenance and storage of equipment for both track and field events is also included.

The technical guidance within this code practice provides a detailed approach to how an athletics track is constructed. The diagram on the following page is designed to help potential clients make the correct decisions at the right times by looking at the ideal routes a project may take from proposal to completion and the information required at each stage.

1 Section One: General Construction Requirements

1.1 Design considerations

Access and participation for all

All sports facilities must be designed to allow everyone to participate, and access and participation audits are an essential part of the design process. Decisions made by the design team, client and users will fundamentally affect the accessibility of the building. Effective and carefully considered management of the facilities is essential to allow access and participation for everyone.

The design and management audit of athletics facilities should be split into two sections.

Designing for accessibility

General accessibility guidance is widely available and covers many aspects of building design including car parking, routes to and around the building, ramps and steps, entrances and reception areas, door widths, circulation spaces, floor/wall surface colour and texture, lifts, toilet provision, counters, signage, telephones, alarms, lighting and acoustics.

For further information on providing people with disabilities with full access to sports facilities, refer to Sport England Design Guidance Note “Access for Disabled People”.

http://www.sportengland.org/disabled.pdf

1.1.1 General Arrangement and Layout

In the United Kingdom it is usual for the infield area of an athletics track to be used for soccer (occasionally rugby). The dimensions of the standard track will accommodate either game as well as the requirement for the athletics field events of javelin, discus, hammer, shot etc (see Fig 1).

Non-standard layouts may also be designed to accommodate sports such as American football in the central area, but these are unusual in the UK and will not be covered in this document. Further information may be obtained from UK Athletics if required. There are also many tracks in existence in the UK that have been converted from imperial measurement (440 yards) to metric (400 metres) but it will be assumed that, wherever possible, a new six-lane track will be constructed to the standard dimensions in Fig 1.

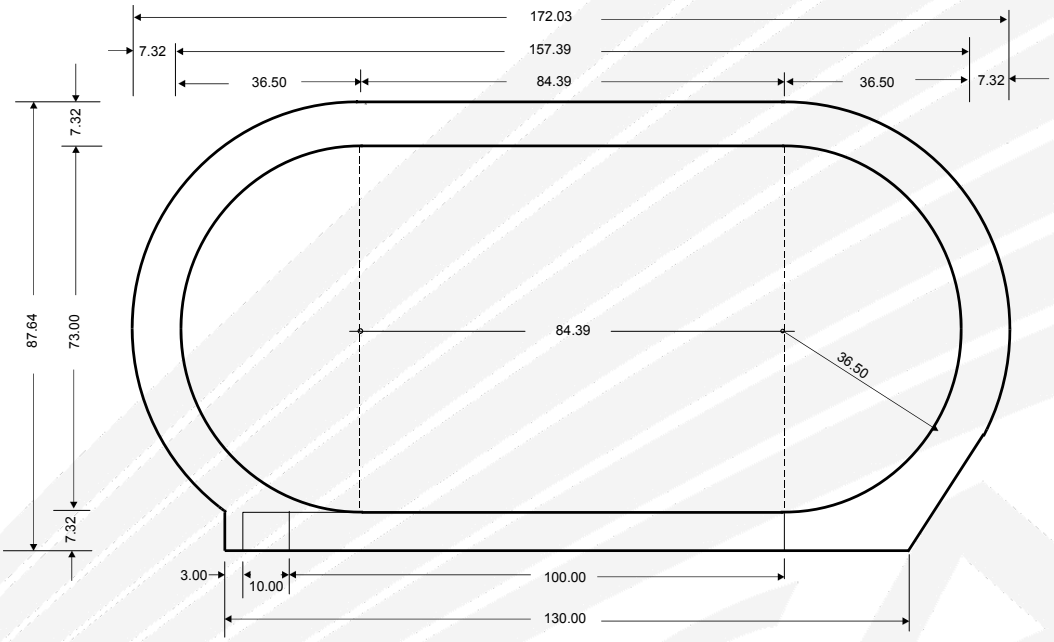


Figure 1 Standard dimensions for 400-metre, six-lane track (radius 36.5m)

The area of land required for a six-lane facility with field events in Fig 1, will be not less than 180m long by 110m wide, on level ground. Milling areas, spectator provision, cut banks, landscaping etc will increase these dimensional requirements.

Consideration must be given to the availability of services such as: outlet for surface water drainage, mains water for filling water jump and for track maintenance, electrical power for floodlights, etc.

1.1.2 Setting out a Standard Track

The inside and outside kerb lines of a standard six-lane, 400-metre track are established using the dimensions illustrated in Fig 2. It is essential that the tangent points A, B, C and D and also the centres of radii, RAD 1 and RAD 2, are permanently located for ease of checking the length of the running line and re-marking the track in future years.

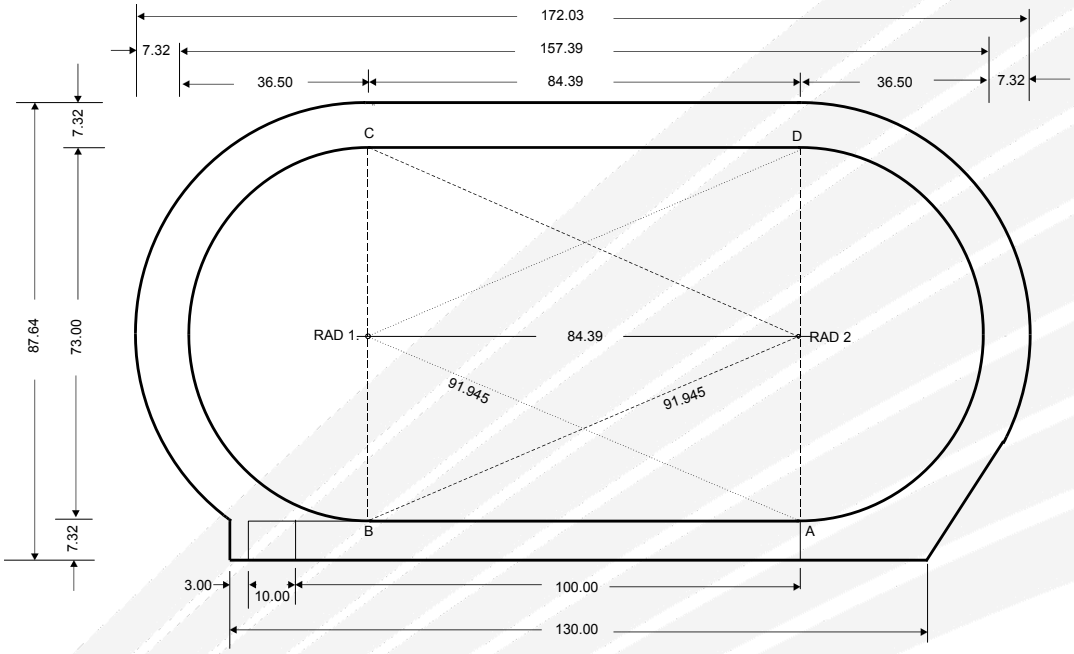


Figure. 2 Setting-out dimensions of a standard 400-metre, six-lane track

These dimensions allow for a theoretical running line (measurement line) at a distance of 300mm from the inside kerb. The running line (measurement line) of each of the other lanes is assumed to be on a theoretical line at a distance of 200mm from the outer edge of the adjacent inside lane.

The required dimensional accuracy of the setting out is as follows:

- 84.39m ± 0.005m for each of the two straights
- 36.50m ± 0.005m for the radius of the semicircle, taken at 12 points on each semicircle

The net effect of these dimensional tolerances must not result in a measurement, on the running line, which is less than 400.0m or greater than 400.04m.

All of these dimensions are taken to the outside edge of the inner track border.

The size of the inside kerb should be between 50mm and 250mm in width and 50mm and 65mm in height, measured from the track surface. The preferred design of inside kerb is a demountable version, fixed to the track surface on the inside lane line of lane No 1.

Though the IAAF Track and Field Facilities Manual specifies the above detail of a raised border on the internal edge of the track, UK Athletics Rules for Competition, Rule 108, allows the internal edge of the track to be marked with a white line 50mm wide with no raised border. It is a requirement ,however that, for Championship events (whether National, Territorial or County) and for any record to be accepted, the inside edge of the track must have a raised internal border or be adequately flagged or coned to prevent any competitor running on the line itself on the bends.

It follows, therefore, that the track must be set out and measured in the standard geometry as if the running line is at 300mm from the painted line with a standard track radius of 36.50m to the white line

At track facilities, where vandalism and security is a problem, this allows the track owner/manager to dispense with an expensive internal, demountable kerb which would tend to be the target of the vandal and thief.

In this case the client must be advised that the use of cones or flags on the bends is essential for Championship events (whether National, Territorial or County) as stated above.

1.1.3 Gradients

The inside kerb line on a standard track must be laid at the same horizontal level throughout the circuit. The inclination in the running direction shall not exceed 0.1% (1:1000) downwards and the lateral inclination (cross-fall) shall not exceed 1.0% (1:100) inwards (towards the infield).

1.1.4 Orientation

The best orientation of any facility will depend on the characteristics of the chosen site. In an ideal situation the straights should run north-south to minimise the effect of low sun in competitors' eyes in the evenings. In the UK, on exposed sites, wind can be a greater problem than sun and the preferred orientation in these situations is with the straights running parallel to the prevailing wind.

1.1.5 Obstructions

In the interests of the safety of the athletes it is recommended that the track has an internal and external peripheral zone that is free of all obstructions such as floodlighting columns, fences, etc. This zone should be at least 1.00m wide, both inside and outside when measured from the infield edge of the inside lane line and the outside edge of the outside lane line.

1.1.6 Steeplechase Widening

The steeplechase event is run on the standard track and requires the addition of a water jump to the standard layout in Figs 1 and 2. The standard track layout is adapted by widening the track at the second bend. This widening may take place either inside lane one (Figure 3) or outside the outside lane (Figure 4).

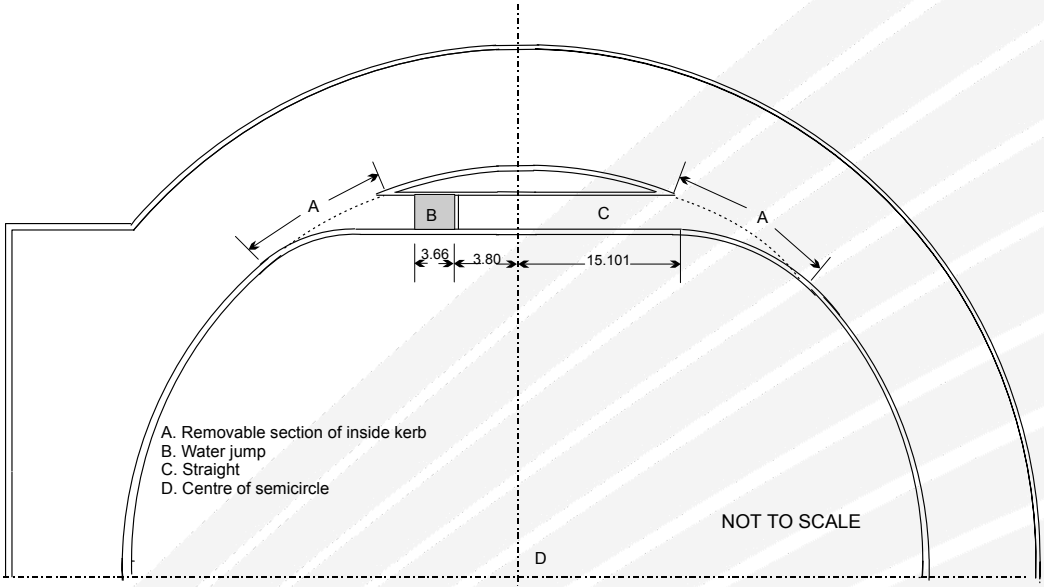


Figure 3 Steeplechase widening on inside of bend of six-lane track

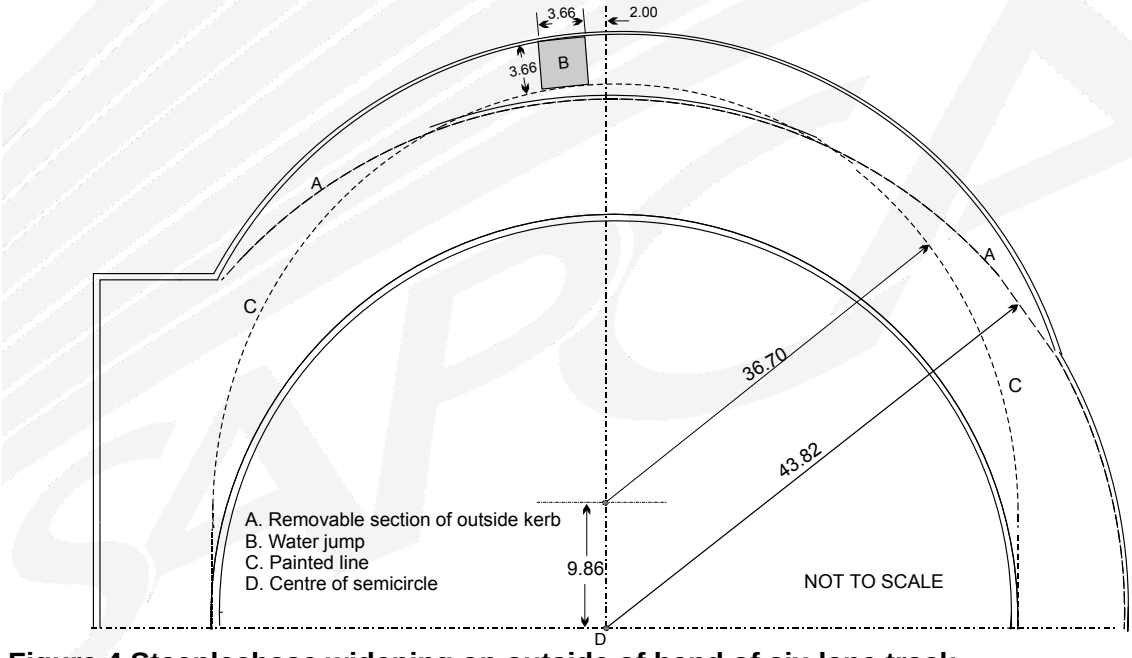


Figure 4 Steeplechase widening on outside of bend of six-lane track

The water jump structure incorporates a hurdle of 0.914m height for men and 0.762m height for women. The length, on the running line, is 3.66m. The width is a standard 3.66m (3No lanes) and the maximum depth is 0.70m (see Fig 5). The top of the water jump pit should be level and the crossfall of the adjoining synthetic surface should be adjusted to provide a smooth transition.

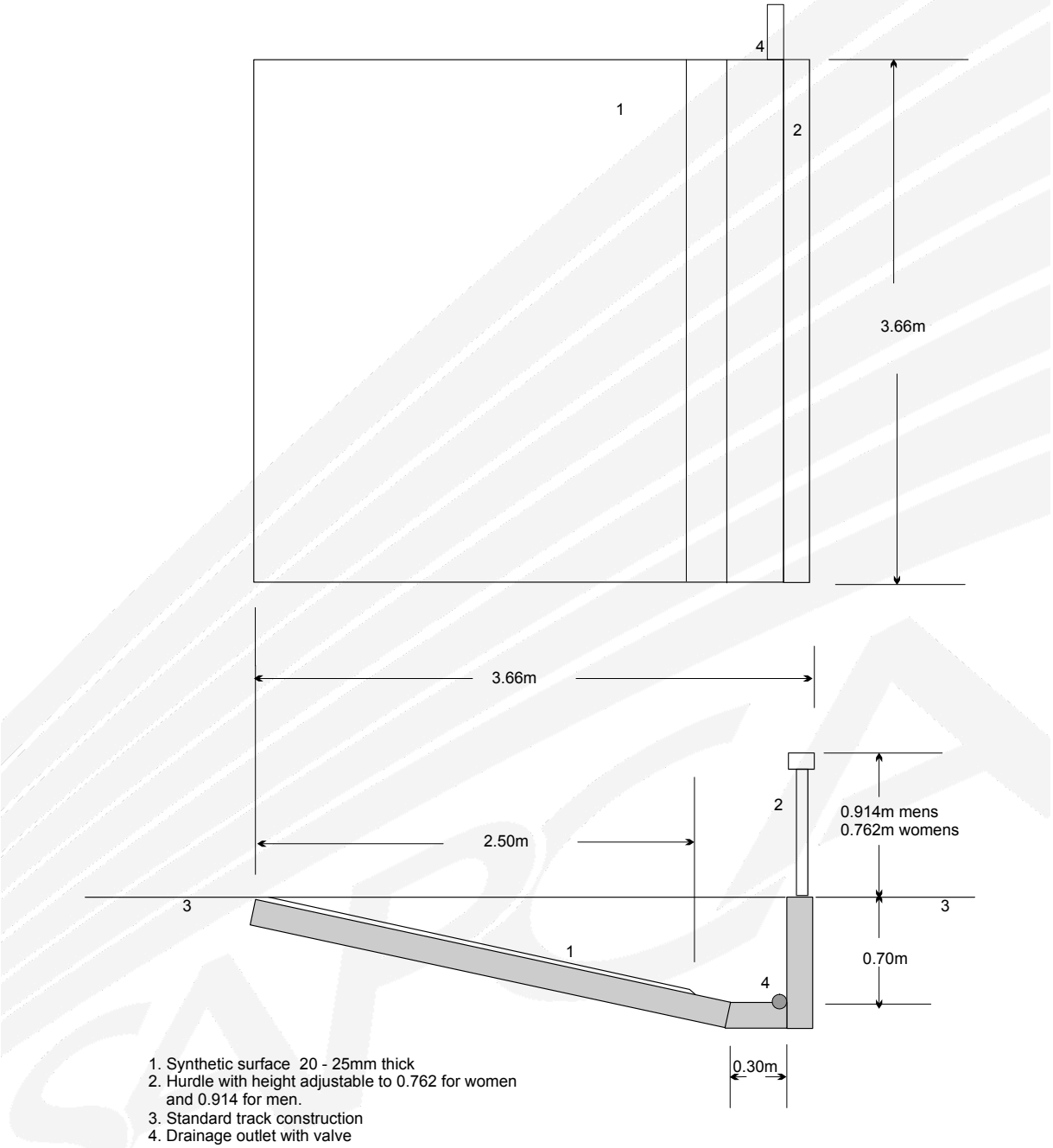


Figure 5 Plan and cross-section of water jump

1.1.7 Requirements for Jumping Events

1.1.7.1 Long Jump / Triple Jump

The runway for the long/triple jump should be 1.22m wide and a minimum of 40.00 m long, measured from the take-off board position farthest from the pit. It should be marked with white lines 50mm wide down each side. The maximum gradients on the runway are the same as for the standard track – see Section 1.1.3

Take-off boards are incorporated into the runway, flush with the finished surface, at distances from the start of the landing area of:

- Long jump – between 1.00 and 3.00m, depending on standard of competition.

- Triple jump – 13.00m, 11.00m and 9.00m (see Fig 6). If required, an additional position at 7.00m may be painted on the surface.

The take-off boards will consist of proprietary designs that allow for interchangeable use of the take-off board with blanking boards surfaced in the same material as the runway. Each board should be numbered and the orientation marked. The take-off and blanking boards should be adjustable in height to avoid trip edges and should have a maximum gap of 5mm around the board when installed in the runway.

The landing area will have an overall length of between 7.00m and 9.00m with a minimum distance of 10.00m from the long jump take-off board to the far end of the landing area. The width of the landing area will be 2.75m minimum. The edging units of the landing area must have permanent, soft, rounded tops with no sharp edges. There must be no obstructions within 12m to the rear of the take-off and 1m to the side of the landing area

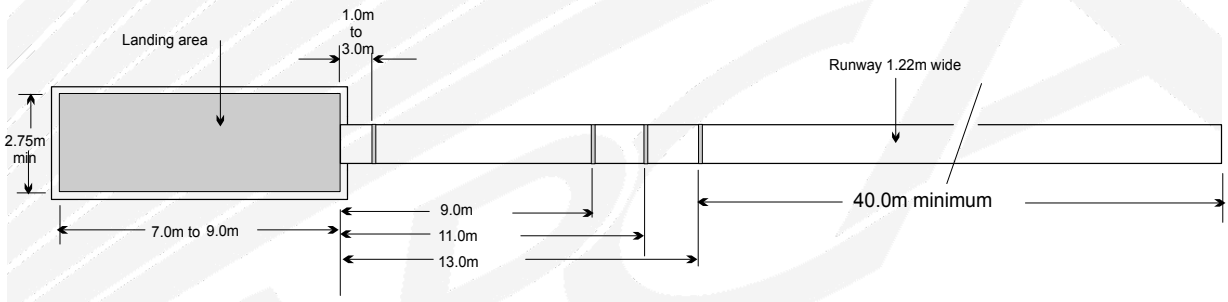


Figure 6 Long jump / triple jump facility

The sand depth in the landing area should not be less than 300mm throughout the whole landing area. The sand should be washed & free from impurities and should be of rounded particle shape with a grain size in the range 0.125 – 0.8mm. Provision should be made to allow the pit of the landing area to drain into the general track drainage system. The base of the pit should incorporate a foundation that will make it easy to maintain and remove the sand (e.g. concrete slabs).

Provision for horizontal jumps may include double width run-ups with double width pits or adjacent pits and run ups

It is advisable to provide some form of cover over the landing area that will retain the sand in windy conditions and help prevent contamination when the facility is not in use, peripheral sand traps with a rubber grillage cover will also help to stop the migration of sand on to the track in windy conditions.

It is permissible to construct a landing area at each end of a runway to take account of variations in wind direction. In this case the take-off boards must be replicated at each end and the overall length of the runway should not be less than 58.00m. For location see Fig 9.

1.1.7.2 High Jump

The runway for the high jump should be a semicircle of at least 20.00m radius with provision for a landing area located at the midpoint along the straight edge. The minimum size of the landing area is 5.00m x 3.00m.

The high jump runway is normally located in the internal sector at one of the bends (see Fig 9), or a runway may be provided at both ends. The oval track may be used as part of the runway if the inside kerb is removable and there is no difference in level between the track and runway area.

The take-off area should be level, using similar material as the circular track. However, in order to shed surface water from this runway, it is usual to create a fall on the finished surface, which should be no more than 1:250 away from the centre of the landing area.

1.1.7.3 Pole Vault

The runway for the pole vault should be 1.22m wide and a minimum of 40.00m long measured from the 'O' line. The runway should be marked with white lines 50mm wide down each side. The maximum gradients are the same as for the standard track – see Section 1.1.3.

A box for inserting the pole is mounted, flush with the surface, at the end of the runway. The box should be 1 metre in length, measured along the inside of the bottom of the box, 600mm in width, at the front end, tapering to 150mm in width at the bottom of the stop-board, where it should be 200mm in depth. The box should be constructed such that the sides slope outwards and end next to the stop-board at an angle of approximately 120 degrees to the base.

The inside edge of the end board of this box is the 'O' line which should be marked with a white line 10mm wide extending beyond the width of the uprights. Pole vault boxes are normally manufactured with steel covers, which may then be covered in the same material as the runway surface. Drainage should be provided to ensure that the box does not collect surface water

The landing area should have a minimum size of 6.00m x 5.00m. To allow for variations in wind direction, it is advisable either to provide landing areas at both ends of a runway (Fig 9) or to construct two pole vault runways, in opposing directions, sharing a common landing area (Fig 10). This is a requirement for a track to achieve full UKA Certification

1.1.8 Requirements for Throwing Events

1.1.8.1 Javelin

The runway for the javelin event should be between 30.00m and 36.50m long and 4.00m wide. The runway should be marked with white lines 50mm wide down each side. The maximum gradients on the runway are the same as for the standard track – see Section 1.1.3.

The javelin runway is normally surfaced in the same material as the track, and the track may be used as part of the runway if the kerb is removable.

A throwing arc is painted on the surface at the end of the runway with a line width of 70mm. The arc should have a radius of 8.00m and the centre point should be permanently marked, e.g. with a metal tube with a synthetic plug.

Because of the stress imposed on the surfacing material at the end of the runway, it is advisable to increase the depth of the surfacing layer to 25mm and, in the case of a porous system, strengthen the material over the final 5.00m.

To take account of varying wind directions it is advisable to install a javelin runway at each end of the track. It is also possible to combine the javelin runway with the high jump fan. See Figures 9 and 10.

1.1.8.2 Hammer and Discus

The facilities for hammer and discus are similar in that the requirement is for a concrete throwing circle, surrounded by a protective throwing cage, with an appropriate landing sector. For locations see Figs 8 and 9.

The diameter of the circle should be 2.135m for hammer and 2.50m for discus.

The circles are normally constructed using structural concrete with a mesh reinforcing, on a crushed stone base layer. The steel rings for both hammer and discus are manufactured with radial bracings to ensure that the ring does not deform during installation. The top of the steel ring should be set to correspond with the surrounding ground level outside the ring, and 20mm above the level of the finished concrete inside the ring. This concrete should have a lightly stippled, rough but not ribbed, granolithic concrete finish and should not be slippery.

A centre mark must be installed using a 4mm-diameter tube with plug.

Drainage should be provided by inserting tubes through the concrete slab into the stone base layer, which, in turn, must be connected to the track drainage system.

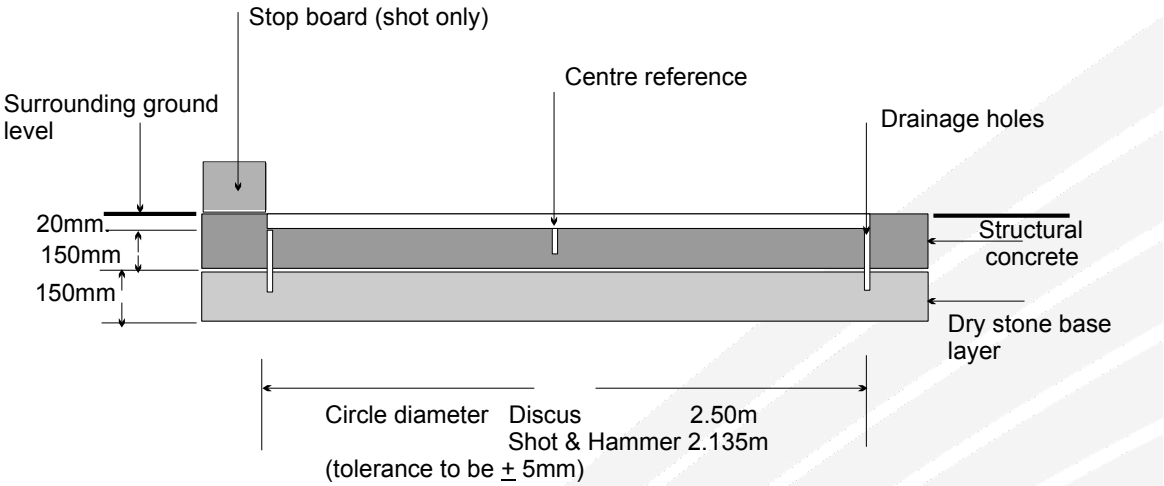


Figure 7 Cross-section of throwing circle construction

1.1.8.3 Shot Put

The dimensions of the shot put circle are the same as those for the hammer in Section 1.1.8.2, i.e. a circle diameter of 2.135m. The construction of the shot put circle is the same as the hammer and discus with the addition of a stop board. This stop board is made of wood or other suitable material and is curved to suit the radius of the circle. The stop board should be 1.20m long, 112mm thick and 100mm high (+ or – 2mm.), painted white. The stop board must be firmly fixed to the concrete surround of the steel ring, positioned centrally on the landing sector and flush with the inside of the steel ring. For locations see Figs 9 and 10.

1.1.8.4 Provision for Disabled Athletes

Provision should be made to accommodate disabled athletes in wheel chairs by installing fixing points at the appropriate throwing circles. (see Fig 8 below)

Suitable hard surfaced routes should also be provided to allow wheelchairs to gain access to the throwing circles and cages.

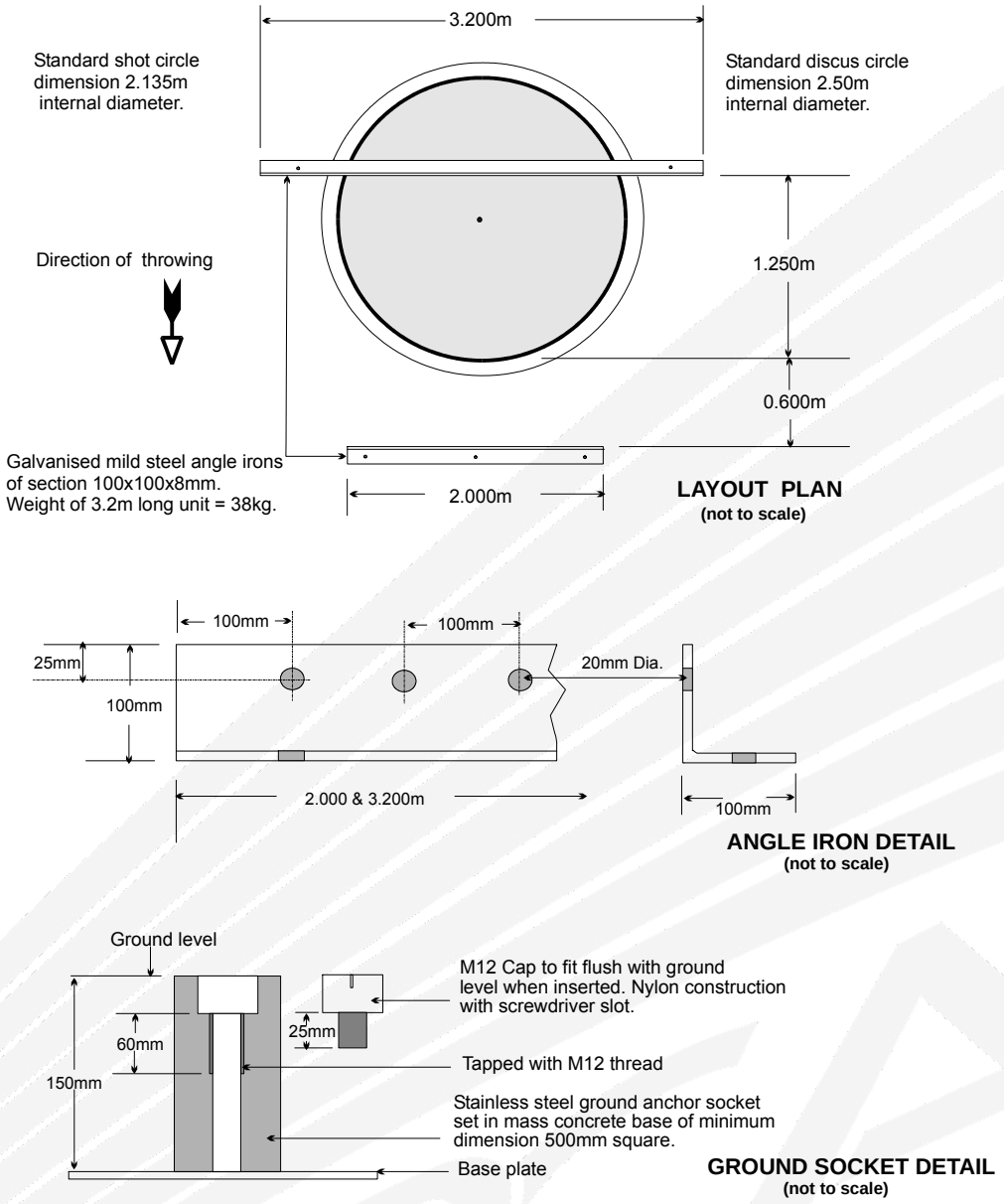


Figure 8 Wheelchair Anchorages at throwing circles for shot and discus

1.1.8.5 Throwing Cages

The correct layout, location and erection of protective cages for discus and hammer events are essential to ensure safety of the competitors, officials and spectators.

The preferred location is on the central axis of the track (see Fig 9 & 10) to ensure the maximum distance from the throwing circle to the track surface.

There are several proprietary designs of throwing cage marketed by different manufacturers but the basic requirement of UK Athletics, Rules for Competition Rule 137, is illustrated in Fig 9 below. This diagram shows a combined cage affording protection for a set of concentric throwing circles for hammer and discus.

The minimum height of the netting for hammer is 7.0m and for discus alone, 4.0m.

Two moveable netting panels, 2.0m wide and at least 9.0m high should be provided at the front of the cage. These panels are constructed as 'gates' to the cage and must be able to open and close to suit left, or right, handed throwers.

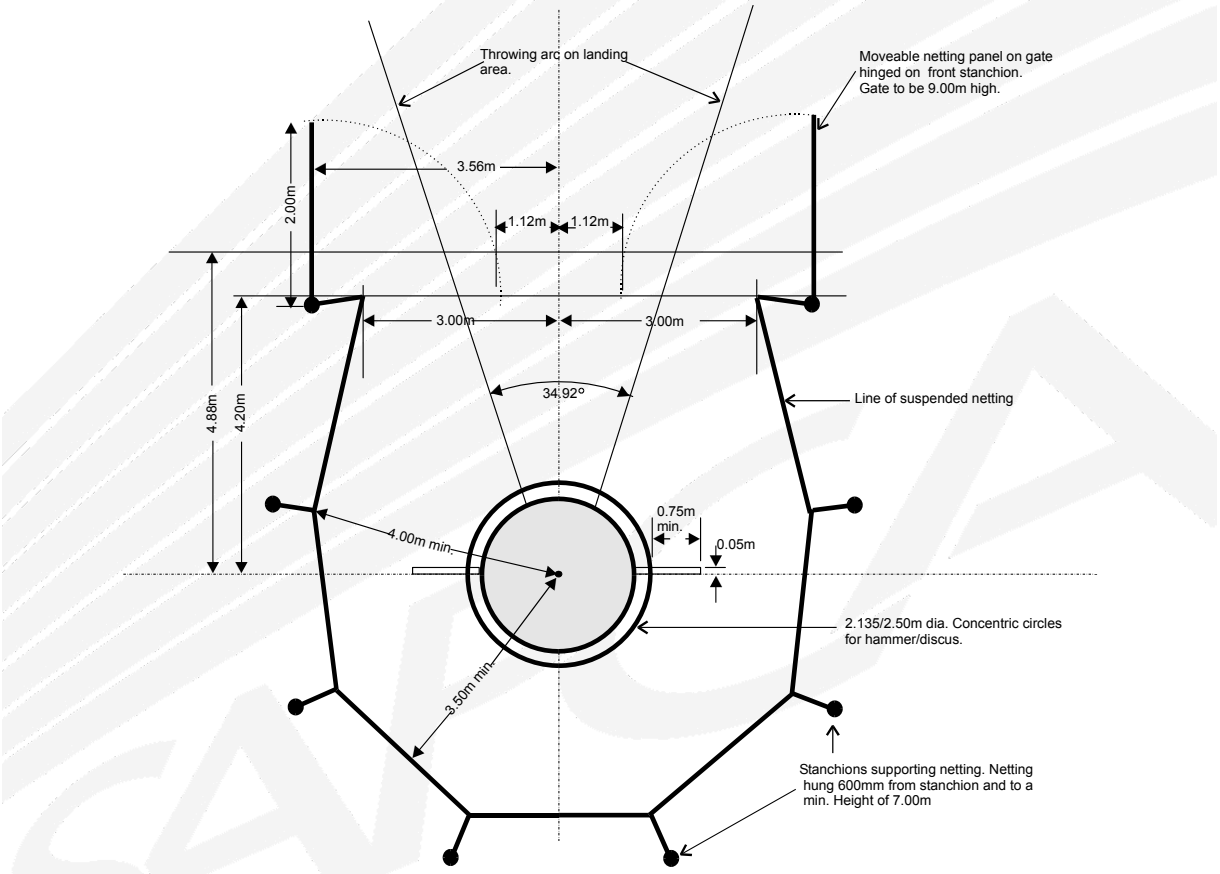
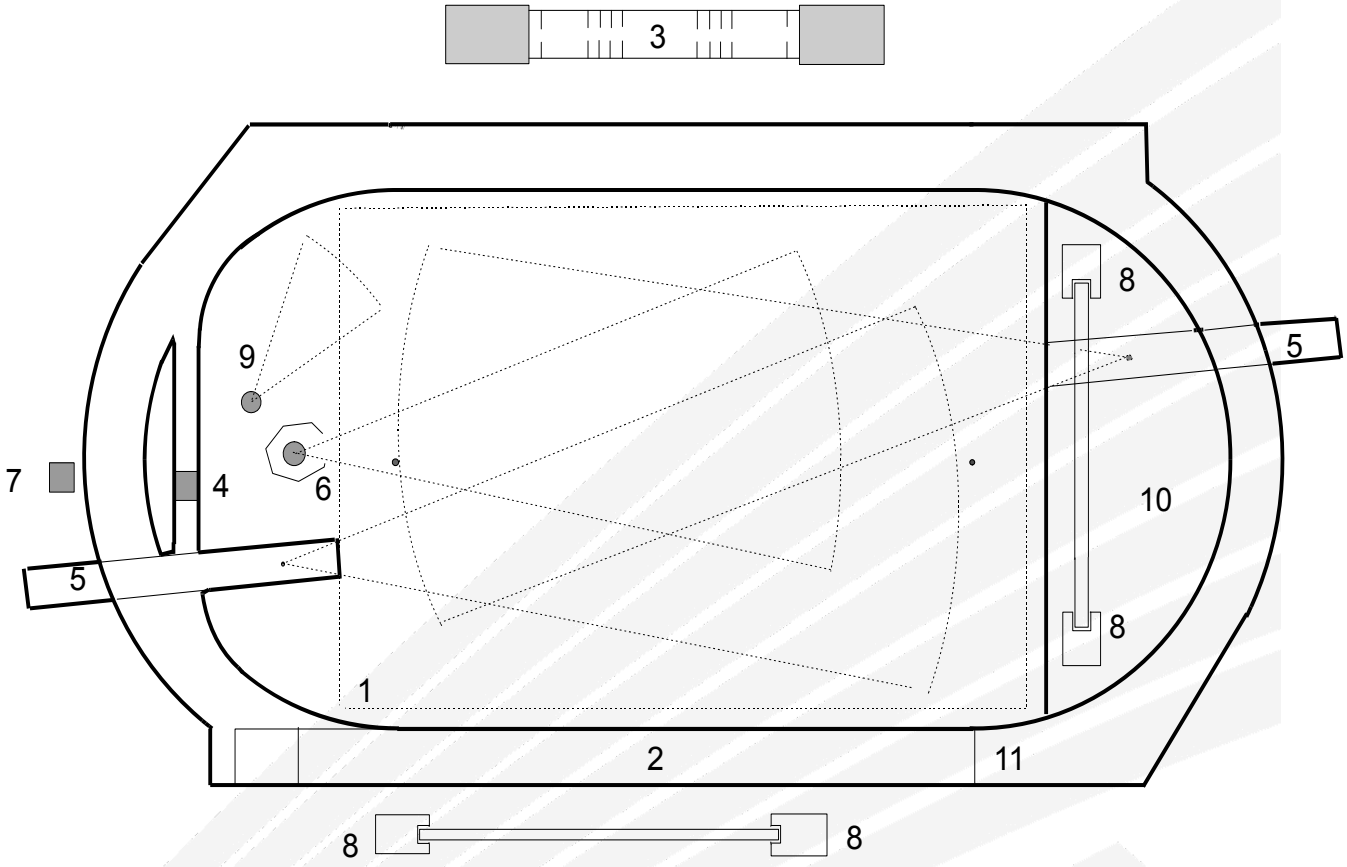


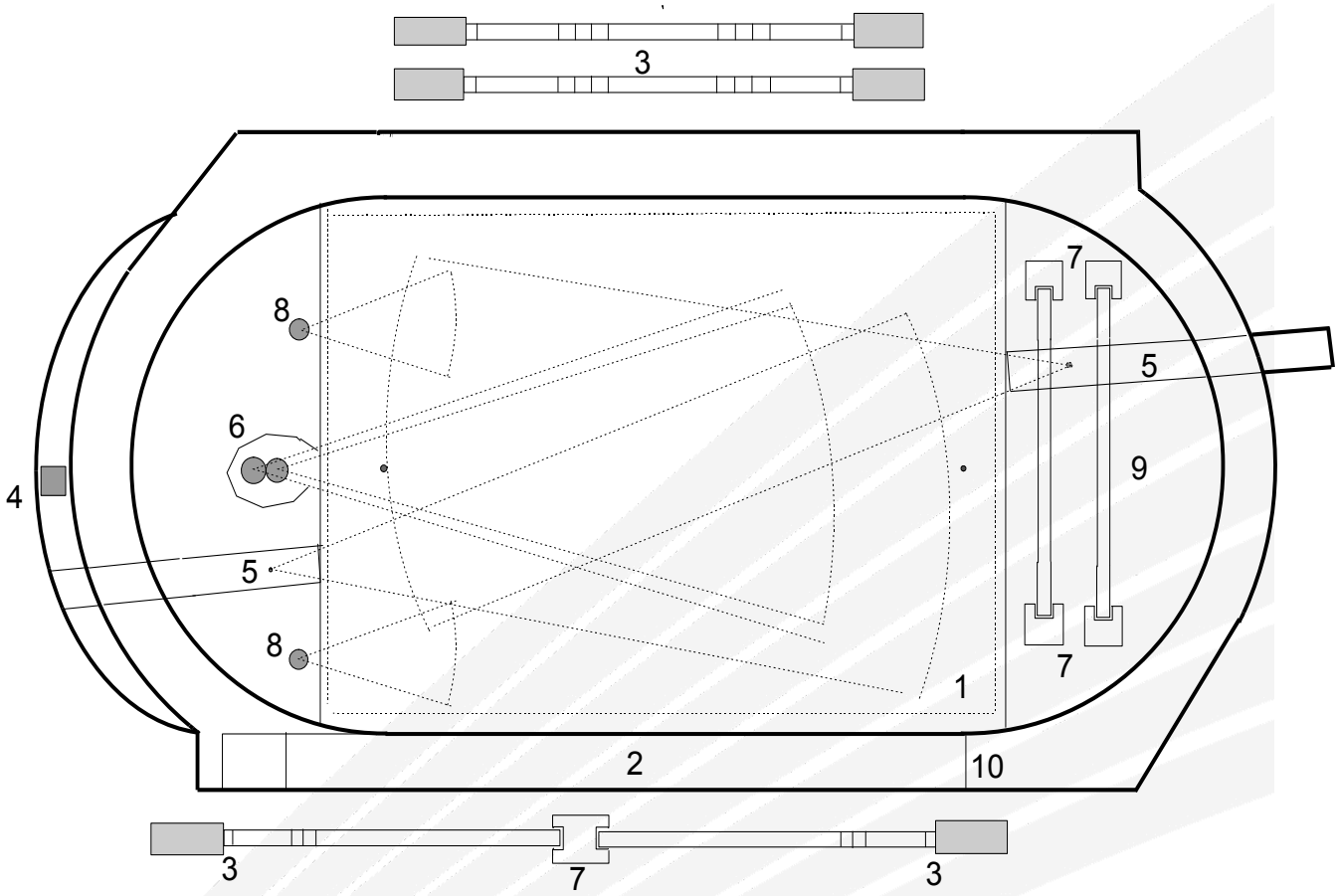
Figure 9 Cage for hammer or discus using concentric circles

1.1.9 Track Layouts



1	Internal pitch	7	Alternative water jump position
2	Standard track	8	Pole vault landing areas
3	Long/triple jump facility	9	Shot put facility
4	Water jump for steeplechase	10	High jump runway
5	Javelin runway	11	Finish line
6	Discus/hammer throw facility		

Figure 10 Layout for six-lane club track



1	Internal pitch	6	Discus/hammer throw facility
2	Standard track	7	Pole vault landing areas
3	Long/triple jump facility	8	Shot put facility
4	Water jump for steeplechase	9	High jump runway
5	Javelin runway	10	Finish line

Figure 11 Layout for eight-lane competition track

For further information on layouts or any other aspect of track regulation, contact UK Athletics at the address given on page 11.

1.2 Earthworks

1.2.1 General

The greatest risks and uncertainty arise from site ground conditions.The earthworks design therefore needs careful attention before starting construction. The extent of earthworks depends on ground conditions and site topography. Tracks are laid to very flat gradients, so sloping sites will require more extensive earthworks than relatively flat ones. The cheapest option will be the one that produces the least amount of spoil or minimises the amount of imported stone. The most expensive tasks are transporting earthworks materials to and from site and the disposal of surplus materials.

1.2.2 1.2.2 Information Gathering

To confirm the scope of earthworks, you need the following information:

- Topographic survey
- Site investigation

To establish how the track will fit into the site, you need an accurate survey that should include the following information:

- Detailed levels across the site
- Site boundaries and existing fences
- Existing trees together with their species and height
- Surface features relating to drainage and services such as ditches, manhole covers and overhead lines. Any manhole covers should be lifted and the purpose, contents and depths of holes recorded
- Any other features such as roads and buildings and rights of way

Whether you intend to use a traditional or a Design and Build contract, the designer needs this information to clarify the site constraints and determine earthworks quantities.

A site investigation involves examining the underlying ground conditions and this is vital for earthworks design. For Design and Build contracts, a quality site investigation must be included in the Tender Documents to enable a realistic design to be produced. Without one, there is a real risk of cost over-runs as a result of finding unforeseen ground conditions.

The scope of the site investigation depends on site conditions and should include examining and sampling the ground conditions on site together with laboratory testing. The information requirements will include the following:

- Ground strength
- Groundwater level
- Topsoil thickness

- Soil particle grading (for coarse-grained soils)
- Soil plasticity indices (for fine-graded soils). Soil plasticity index is a measure of soil clay content which is vital to assessing shrinkage potential
- An engineering description of the ground
- A historical desk study of the site

For more difficult sites such as river flood plains, steeply sloping sites or derelict sites, more extensive site investigation will be required. Again, you need professional and site-specific advice.

1.2.3 Site Levelling and the Formation

Tracks need to be founded on competent ground. Topsoil, turf and vegetation are not suitable and therefore must be stripped from the site. Topsoil can be re-used for landscaping or spectator mounds if space allows.

The 'formation' is the level ground on which the track construction is built. It is preferable that the formation is natural ground because soil

is usually stronger when it is undisturbed. Relatively flat sites can be excavated down to natural ground ('cut to solid') without producing large volumes of spoil.

The central area, within the track kerb, is normally grassed to act as a landing area for the throwing events and possibly as a soccer field. The finished level of this area must be at the same finished level as the track surface, though it may be 'crowned' to facilitate surface-water run-off.

Cutting to solid will be less practical for steeper sites because much more soil has to be excavated. If excavated soil cannot be used elsewhere on site, it has to be transported to a tip, which is very expensive. In these situations, re-using excavated soil as fill to build up the formation ('cut and fill') is much cheaper. However, re-used soil has to be compacted by mechanical plant to obtain adequate strength and density. Compacted strength and density depend on the type of soil, its water content and the amount of compactive effort applied. If filling is required and there is no source of suitable soil on site, it will be necessary to import suitable granular fill material. All filling should be carried out in layers not exceeding 150mm thickness, and each layer should be compacted to the Highways Specification standard before the next is spread.

The formation should be treated as part of the finished track. It is vulnerable to softening in wet weather and therefore has to be covered as soon as possible. Any soft spots in the formation must be dug out and replaced with imported crushed rock, such as that used for the sub-base (see Section 1.5). The finished formation should be trimmed to a tolerance of ±25mm.

1.2.4 Slope stability

In general, steep cutting into slopes brings a risk of landslip. A landslip is a mass movement of sloping ground. Landslips cause widespread damage and can be dangerous. They may occur immediately or much later and can be a long-term danger. Not all slopes are unstable

and landslip hazard can be avoided by using correct techniques. If you need to cut into steep slopes to make the track fit the site, specialist advice is essential.

Cuttings into stable ground should be made as shallow as possible to allow ease of maintenance. Allowable cut angles will be site-specific.

Depending on site constraints, there should be minimum 1m margin from the line of the track surround-fence to the edge of any embankment.

1.3 Weedkilling

Following excavation and levelling, the site should be treated with an appropriate residual herbicide. Application should be by a competent person trained in accordance with Health and Safety regulations.

It is not possible to guarantee total prevention of future weed growth. To do so would necessitate the use of herbicides of such toxicity, or in such quantity, as to constitute a danger to humans and wildlife.

1.4 Drainage

A suitable drainage scheme should be installed which will:

- ensure that all surface water is removed from the site at a rate which will safeguard against surface flooding occurring
- not allow excess water to remain present in the construction which might result in a reduction of the load bearing capacity of the formation or in any frost damage to the construction
- protect the installation from the effects of ground or surface water from the surrounding areas

Lateral drains may be incorporated beneath the infield area of the track, the centres of which shall be determined by the composition of the subsoil and the designed infiltration rate. Centres usually range from 5m to 15m. The ends of lateral drains should be capped to prevent contamination, and connectors should be used when joining lateral drains to collector drains.

Collector drains should be located on the inside of the internal perimeter edging. The purpose of the collector drain is to ensure that the formation of the track construction is adequately drained, to gather the surface water from the lateral drains below the infield area and to collect any water from the running surface of the track. Silt/inspection chambers should be provided at the tangent points of the track to allow maintenance of the system.

Commonly, the run-off from the track surface is collected by an additional collector drain, located on the inside of the internal kerb. This may be open or closed in construction and should discharge into the main collector drain at appropriate locations. (See Figure 12 & 13)

The diameter of the pipes will depend on the catchment area being drained and on the gradient of the pipe run. This gradient should not be less than 0.3% (1:300)

Field events should be catered for in the drainage layout by taking individual pipe runs to the water jump, landing areas, runways, including take-off boards, throwing circles, etc. Connections to the collector drain from the field event areas should preferably be made within the silt traps.

External perimeter drains (which may also act as collector drains) must be installed at the toe of any embankments to prevent run-off from surrounding areas. Silt/inspection chambers should be constructed where perimeter/collection drains change direction, and the provision of rodding eyes should be included at the head of collector drain runs for ease of access for maintenance.

Drains usually consist of perforated plastic pipes, bedded on, and backfilled with, clean stone. No drains should have less than 150mm cover over the top of the pipe, and no drain should be laid to a fall of less than 0.3% (1:300) unless advised by manufacturers' instructions. In certain sub-soils where silting-up may be a problem, geotextile membrane may be used to line the trench prior to backfilling.

All drain tracks that cross the track construction should be backfilled using lean-mix concrete below the formation level of the track.

The installation of an athletic facility may disturb and render ineffective any existing land drainage. Where existing land drains are severed they should be connected into the new perimeter drain.

Wherever possible, drains should discharge into an existing outlet or natural watercourse. If ground conditions permit, soakaways may be considered, but due regard must be given to location and size and to ensuring that the ground conditions are suitable for soakaway construction.

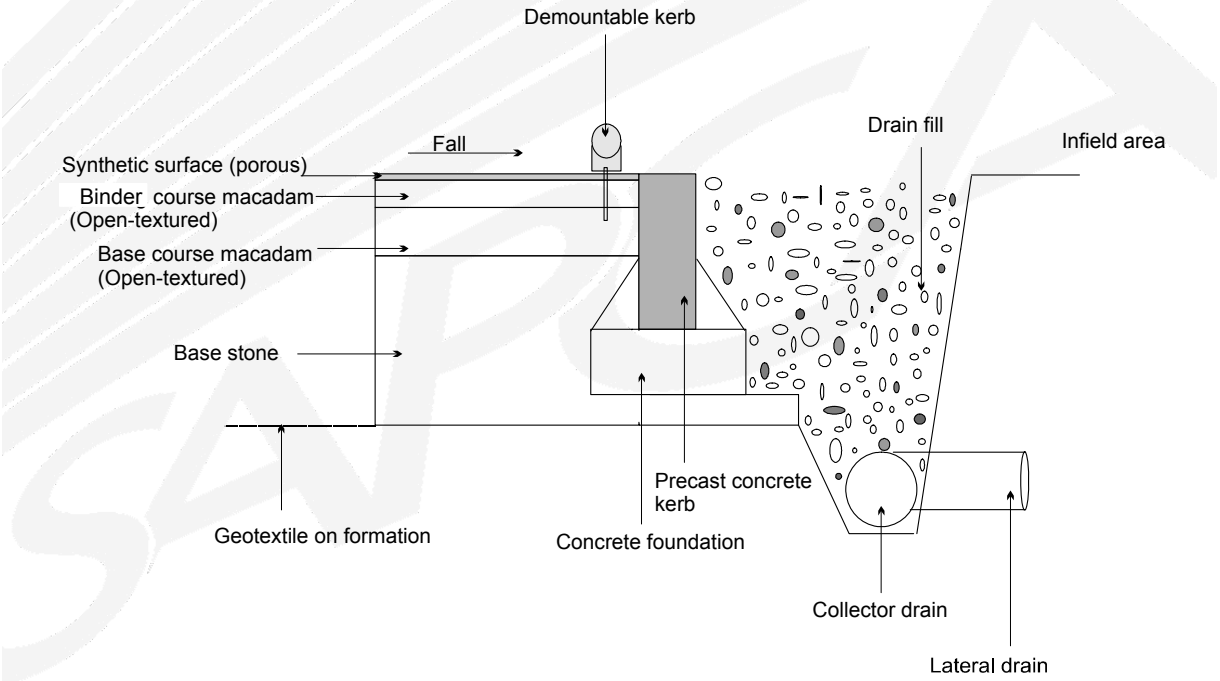


Figure 12 Typical cross-section of track (porous and sandwich systems)

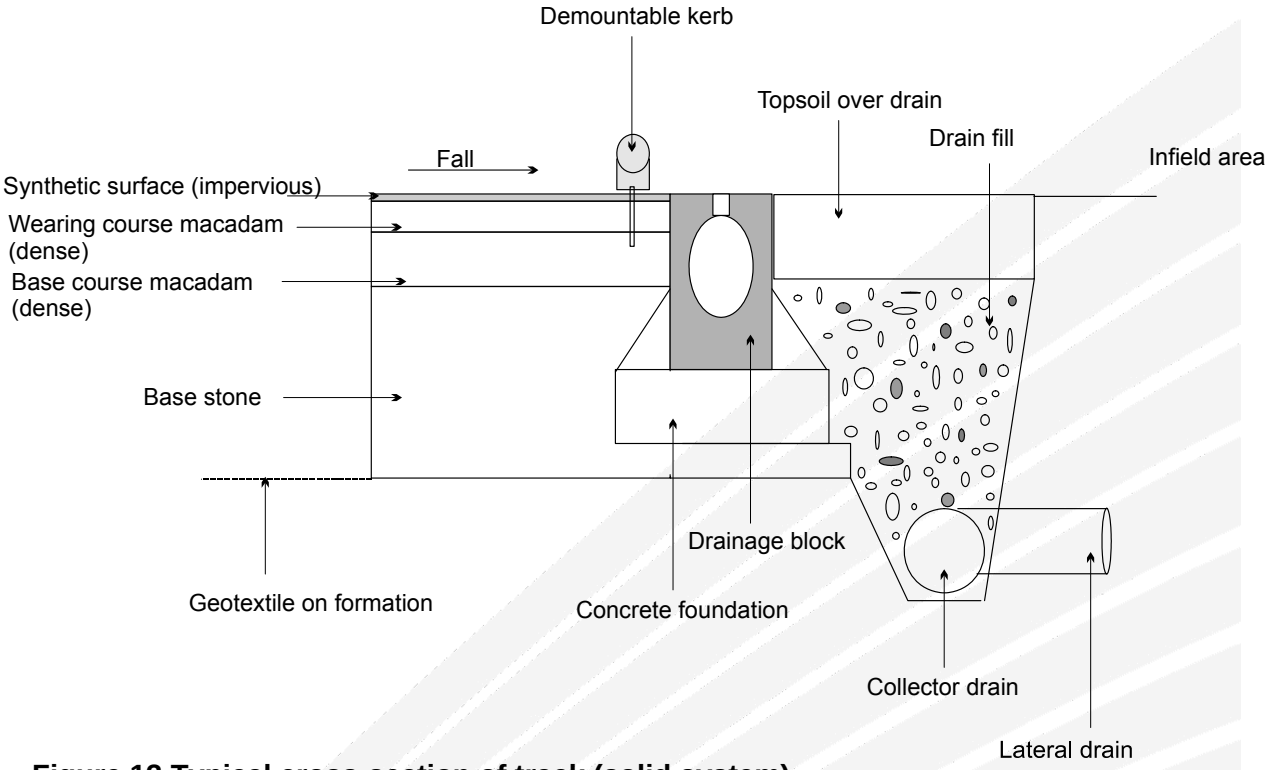


Figure 13 Typical cross-section of track (solid system)

Note: The drainage detail for the solid system in Fig 11 should also be used when a sandwich system is specified.

1.5 Ducts

It is advisable that ducts be provided below the track construction for future connection of services such as water, power, public address, timing systems, etc. This provision will avoid future excavation of the track surface. These ducts should cross from the outside of the outside kerb line to the inside of the internal collector drain at the finishing line and at each tangent point of the track. Inspection chambers should be provided where the ducts terminate. Drawstrings should be installed in all ducts during the construction phase The size and number of ducts will be decided by the owner/user of the track. All track crossings should be backfilled with lean-mix concrete below the formation level of the track construction.

1.6 Sub-Base

The sub-base to a new track, including field-event areas, should be designed to meet the following criteria:

It should be capable of supporting – and transmitting to the existing ground – the loads of all vehicles, plant, machines and materials to be used in the construction, without causing deformation of the site.

After the track is built, it should be capable of supporting and transmitting all loads on the finished surface from athletes, officials, spectators and maintenance equipment without permanent or long-term deformation of the synthetic surface.

It should ensure that water, whether rainwater or natural ground water, will drain away freely through the sub-base material, either into the natural subsoil or into the drainage system.

Foundations should be constructed using hard, clean crushed frost-resistant aggregates. The grading of the sub-base material must be such as to provide stability but at the same time remain porous. The material should be laid in layers not exceeding 150mm, each layer being compacted before the next is laid. The nominal compacted thickness of sub-base stone should be not less than 200mm. Upon completion there should be no detectable movement under the roller. The surface level tolerance should be within ±10mm of the design level, and when checked with a 3m straight edge there should be no deviation greater than 10mm.

Depending on the type and condition of soil, it may be necessary to install a geotextile membrane on the formation prior to sub-base installation in order to prevent contamination from the sub-grade.

In order to support the loads imposed on the track construction by maintenance equipment servicing the internal pitch areas, it may be necessary to provide an increased depth of base stone to strengthen the base at specific access points. These access points should be identified when the track is complete.

1.7 Perimeter Edging

A perimeter edging is normally installed to contain the synthetic surface and, in the case of the inside kerb, define the measured length of the track. (Section 1.1.2) Pre-cast concrete kerbs or precast drainage blocks are usually used. Whichever detail is chosen it must be firmly bedded in concrete and be laid to a line and level tolerance compatible with Section 1.1.2.

1.8 Base Construction

The structural base of the track is conventionally constructed using bituminous macadam in a two-layer system to BS 4987. In the case of a porous track (see Section 1.9.3) or sandwich track (section 1.9.2), the macadam would be open-textured and in the case of a solid system (Sections 1.9.1 and 1.9.4) the macadam would be of a dense grading and specification. To meet the stringent requirements of compaction and surface tolerances, the macadam base layers are normally installed using conventional road surfacing plant and equipment.

Macadam specifications for a porous construction should be:

An open-textured base course consisting of a minimum of 40mm, nominal compacted thickness, of 14mm or 20mm nominal-sized aggregate, plus an open-textured binder course consisting of a minimum of 25mm, nominal compacted thickness, of 10mm nominal-sized aggregate, both to BS 4987. See Fig 12.

This macadam specification should also be used when constructing new sandwich system tracks

And for solid PU construction the specification should be:

> A dense base course consisting of a minimum of 40mm, nominal compacted thickness, of 14mm or 20mm nominal-sized aggregate, plus a dense binder course consisting of a minimum of 25mm, nominal compacted thickness, of 6mm nominal-sized aggregate, both to BS 4987. See Fig 13.

The surface tolerance required on the wearing course material is 6mm under a 3m straight edge. Care must be taken at adjacent paving bay joints to ensure that no lips or edges are left. Where prefabricated systems are to be installed as the final surface, finer tolerances may be required.

1.9 Synthetic Surfaces

In the present day, in the UK, there are four basic types of synthetic track surface in use. These generic types may be defined as follows:

a. Solid PU (polyurethane) tracks which are impervious to water

b. Sandwich systems incorporating a solid PU surface over a porous base

c. Porous PU tracks which allow the through passage of water

d. Prefabricated systems, manufactured off site, normally impervious

The choice of surfacing system will depend on the primary use of the track and field facility and the budget available. If it is the ambition to stage major national or international meetings on the track, a solid system would normally be specified. If the budget will not run to this system, then the sandwich system is an acceptable alternative. For the majority of tracks used by club, school and college athletes, porous systems provide an acceptable solution at a fraction of the cost of the solid PU systems.

The choice of installer and system should be carefully considered with examination of previous reference installations, both recent and after some years of use. SAPCA will provide a list of member of the Track and Pitch Group, who are subject to rigorous vetting to achieve membership.

The durability of the track system is substantially dependent on the quality of the polymeric materials incorporated in the construction. These materials are only available from a limited number of manufacturers worldwide, and the sources of any proposed materials should be checked as being from a supplier of known reputation and quality. The IAAF has a system of product certification for synthetic surfacing products.

The first three alternative systems utilise a combination of polyurethane resins and rubber granules, mixed on site and spread on to the macadam base to provide the running surface.

1.9.1 Solid PU Tracks

The solid PU systems are classified as ‘cast elastomers’ and incorporate rubber granules in a matrix of two-part polyurethane resin. This material is mixed and cast in-situ to form an impervious resilient system. The overall thickness may be achieved in more than one pass and the surface is commonly given a textured finish by the application of coloured EPDM

rubber granules on to the uncured base material. After final cure, the excess granules are removed to leave the finished running surface. As the solid PU surface is impervious, great care and expertise is required to ensure that surface water does not remain on the completed track after heavy rain.

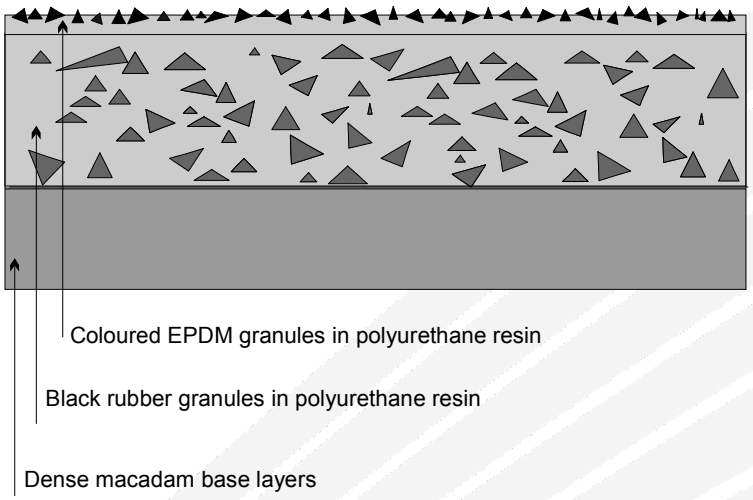


Figure 14 Diagrammatic cross-section of solid system

1.9.2 Sandwich Systems

By its nature, the solid PU system is a very expensive surface to construct, due to the high percentage of two-part polyurethane in the construction. In the sandwich system this cost is reduced by installing a base mat of bound rubber granules, as in the porous PU system (Section 1.9.3), and sealing this with a thinner layer of the cast elastomer material as in the solid PU system . The surface texture is achieved by applying rubber granules to the uncured surface as in Section 1.9.1. This system provides a solid PU surface at a much reduced cost, though some of the advantages of the solid system may be lost, particularly on resurfacing.

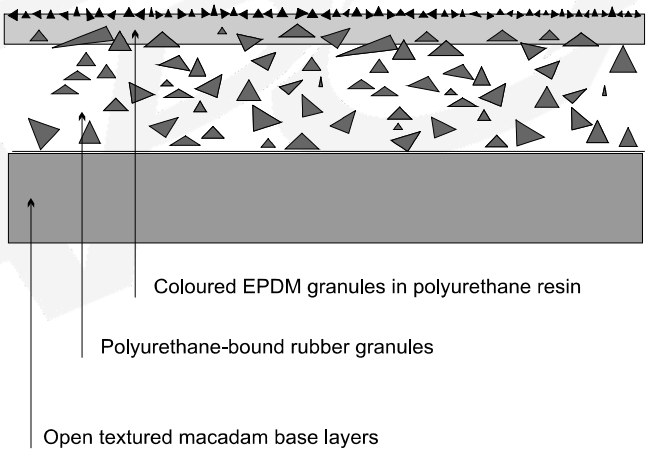


Figure 15 Diagrammatic cross-section of sandwich system

1.9.3 Porous PU Tracks

The most popular synthetic track system in the UK is the porous PU type, which incorporates a base mat of polyurethane-bound rubber granules and a finishing layer of spray-applied coloured EPDM granules in a polyurethane matrix. The top 'structure coat' provides the traction properties of the surface whilst strengthening the base mat and providing protection from ultra-violet attack. The polyurethane resins used in these systems are known as 'moisture cure', as opposed to the two-part cure of the 'cast elastomer' systems. The nature of the construction methods ensures that the system remains porous, which is a great advantage in the UK climate.

This construction is not as robust as the solid PU systems, but re-texturing at the appropriate time can ensure an extended lifespan. In the areas of high wear, such as sprint starts and long jump and high jump take-offs, it is possible to strengthen the porous system locally by 'grouting' the pores of the base layer with the cast polymer materials.

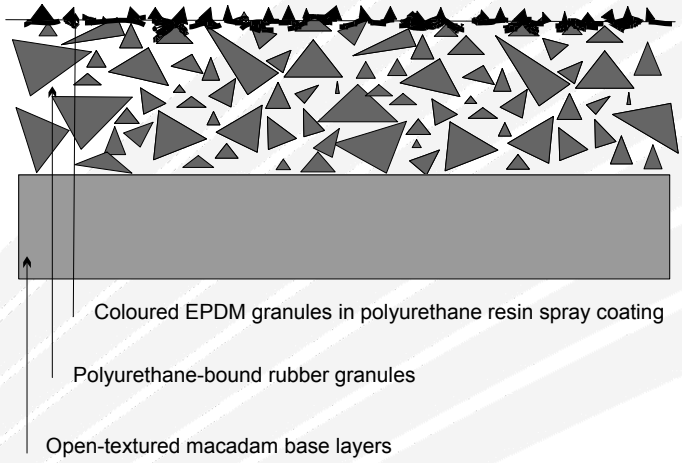


Figure 16 Diagrammatic cross-section of porous system

1.9.4 Prefabricated Systems

Prefabricated systems use factory-produced sheet materials based on rubber-type compounds. These sheet materials are usually impervious and have the advantages of consistency in resilience and thickness achieved during manufacture. Since the thickness of the surfacing layer cannot be adjusted on site to accommodate irregularities below, the base layer of dense macadam asphalt must be engineered to a very fine tolerance.

The adhesive bond between the prefabricated surface layer and the engineered base is crucial to the performance of this system.

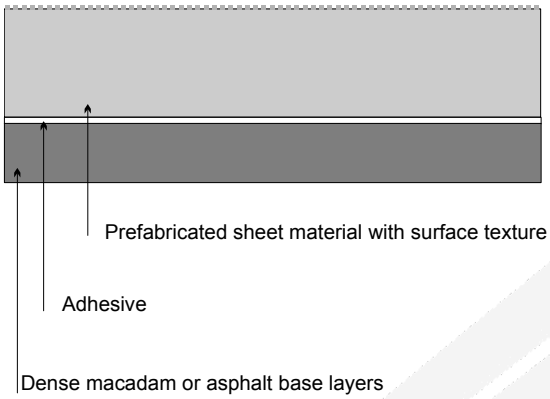


Figure 17 Diagrammatic cross-section of a prefabricated system

1.9.5 Thickness

Upon completion of the track, the synthetic surface must be an average of at least 12mm thick, with no areas less than 10mm. Where the thickness of the track system is disputed, measurements should be taken in accordance with the method laid down by the IAAF.

At areas of high impact, such as the end of the javelin runway, the water jump landing area, the high jump take-off and the area between the triple jump take-off board and landing area, it is advisable to increase the depth of the synthetic material to 25mm by adjusting the level of the base. See Fig 5 and Section 1.1.8 (i).

1.10 Testing

All reputable installers of synthetic systems for athletics will have recent test data on the surfaces they offer. These tests will have been carried out by an independent test laboratory on samples of the surface material or on tracks laid by the installer. These tests are designed to establish the durability of the surfacing system and its suitability, in performance terms, as a surface for athletics, over a period of time. In the UK, tracks are subject to a harsh climatic environment, with a wide temperature range, and all track surfaces must be designed to cope with the damage inflicted by spikes.

The test criteria for track surfaces fall into two categories:

A. Tests carried out by inspecting the final installation:

1. Imperfections such as bubbles, cracks, delamination etc
2. Colour uniformity
3. Drainage of the surface after rain
4. Flatness, i.e. surface level tolerance
5. Thickness of the surfacing layer throughout the facility

B. Tests carried out on the surface material either on site or in the lab:

1. Force reduction, i.e. the reduction in impact force caused by the surface

2. Modified Vertical Deformation, i.e. the degree of deformation of the surface under impact

3. Friction, the determination of potential slip between shoe and surface

4. Tensile properties, i.e. the strength of the surfacing material in tension

The IAAF limits for these performance tests are included in Table 1 below. The table also proposes appropriate test limits for the club/school/college standard of track in the UK.

Where a new track is being constructed for National or International competition, within the UK, the IAAF limits should be adopted.

For further information on test methods and further detail on the acceptable limits, the current IAAF Track and Field Facilities Manual should be consulted. Information on independent test houses with appropriate experience can be obtained from SAPCA or UK Athletics.

Table 1 gives the limits from IAAF and the standard UK for the performance tests highlighted.

TESTS	**IAAF LIMITS**	**UK LIMITS**
A.		
1. Imperfections	No serious imperfections	No serious imperfections
2. Colour	One point on Methuen Handbook	Per BS 4800\5252
3. Drainage	No surface water after 20 min	No surface water after 20 min
4. Flatness	6mm below 4m straightedge 3mm below 1m straightedge	6mm below 3m straightedge 3mm below 1m straightedge
5. Thickness	Average 12mm Min 10mm	Average 12mm Min 10mm
B.		
1. Force reduction	35% to 50% between 10°C and 40°C	32% to 52% between 10°C and 30°C
2. Modified deformation	0.6 to 2.2mm between 10°C and 40°C	0.6 to 2.5mm between 10°C and 30°C
3. Friction	Not less than 0.5 when wet	Not less than 0.5 when wet
4. Tensile properties	Tensile strength of 0.5 MPa for solid and 0.4 MPa for porous systems Elongation at break not less than 40%	Tensile strength of 0.5 MPa for solid and 0.4 MPa for porous systems Elongation at break not less than 40%

Table 1 IAAF and UK limits for performance tests

Note: Within the prescribed range of acceptable values for Force Reduction, it is recommended that tracks, built primarily for competition, are designed at the lower end of the range, whereas tracks intended primarily for training and the use of young athletes, be designed at the higher end of the range.

1.11 UK Athletics Certification Procedure

Track. Certification Procedure as from1st January 2006

A change to the procedure for the grading certificates issued to athletics tracks in the UK has been considered and will become operative from 1 October 2005.

The new system, it is hoped, will remove the complexities of the information shown on the certificate under the present system and will centre around grading by numbers which will be indicated on the certificate. This will be backed-up, on separate paperwork, by a clear explanation of the grading categories. The track assessor will complete a check list, having made the assessment, and based on this the grading will be decided. A copy of the check list, which will be part of the assessors' paperwork, will be sent to the facility and will be posted on the UK Athletics web site. This will enable all to see the basis for the grading applied.

If there are any questions on this or any other related relating to certification matter please contact Bill Adcocks at the UKA office, direct number 0870 99868704 any Tuesday or Wednesday.

Track certificates will remain valid for FIVE years from the date of the inspection unless suspended following annual inspection.

Applications for certification for new tracks or re-marked tracks must be accompanied by a full survey questionnaire completed by an accredited surveyor.

Certificates will be issued in the following categories:

Class 1 Meets the specification and requirements for all competition under UKA rules including Women's steeplechase, having adjustable barriers.

Class 2 Meets the specification and requirements for all competition under UKA rules excluding Women's steeplechase, not having adjustable barriers.

Class 3 Meets the specification and requirements for all competition under UKA rules excluding Women's steeplechase, not having adjustable barriers.

Class 4 Meets the specification and requirements for all competition under UKA rules excluding Women's steeplechase, not having adjustable barriers. Not having a valid survey, performances are not acceptable for record purposes

Class 5 Restricted Certificate

Class 6 Non-standard tracks

From April 1 st 2001, all competitions under UK Athletics Rules should be held only on certified tracks.

UK Athletics will keep an updated record of all certifications and these will be available on request. Details will be published on the UK Running track directory www.runtrackdir.com (courtesy of Tim Grose).

1.12 Equipment

1.12.1 Acquisition of athletics equipment

Purchasers of athletics equipment should ensure that only equipment that meets the IAAF specifications is bought. Most equipment catalogues indicate whether or not these requirements are met. The only permitted exception to relates to throwing cages, where the specification shown in the UKA Rules for Competition is acceptable. However, UKA recommends that any new cage purchased should meet IAAF requirements, although this has yet to become mandatory.

Purchasers should also be aware that the IAAF specification is not necessarily a guarantee of quality. For example, the minimum sizes of foam landing areas are shown in the IAAF handbook but these may not be appropriate a facility planning to host area, national or international competitions. The IAAF specifications do not include recommendations for foam densities, quality of strapping or covers. To purchase the cheapest piece of equipment that meets IAAF specifications is often not the best course of action.

Purchasers should always seek three tenders and then evaluate each of these by visiting facilities already equipped by each of the companies submitting bids. Views about the quality of equipment should be sought from facility managers and users.

All facilities should be fully equipped since certificates are awarded only to tracks which make provision for all track and field events. Care should be taken to purchase equipment suitable for all age groups.

UK Athletics has a list of approved equipment manufacturers and suppliers.

For a comprehensive list see Appendix 1

For International events, under IAAF rules, all equipment must have IAAF Certification and reference should be made to the appropriate section of the IAAF handbook.

1.13 Fencing

1.13.1 Boundary Fencing

The choice of surround fencing is usually dictated by site constraints, access considerations and budget. The two basic functions a boundary fence should fulfil are to:

- restrict access to the athletics area
- keep animals from straying into the area

Each site will have its own specific requirements in terms of design and available budget. A good contractor should be able to demonstrate a variety of options and advise on the advantages and disadvantages of each system. However the following guideline requirements apply generally:

1.13.1.1 Height

The maximum/minimum height of fencing is usually determined by the track location in relation to surrounding properties and local planning requirements. All safety standards should be adhered to.

1.13.1.2 Access

Entry into the athletics area will be required by competitors, coaches, spectators and maintenance machinery. One double gate is therefore a minimum requirement. Additional pedestrian gates to be provided as required.

1.13.1.3 Materials

There are three basic types of cladding:

- Chainlink
- Weldmesh rolls
- Weldmesh panels and proprietary systems

The support steelwork specification will depend on the gauge of fencing. Below is a minimum specification, but each site must be considered separately, taking into account ground conditions and exposure.

a) Chainlink

For a heavy duty 2.75m high fence chainlink netting should be plastic-coated with a galvanised core, 50mm x 50mm mesh x 4.75mm/3.55mm gauge. It should be secured with straining wires, using galvanised winders, stretcher bars, nuts and bolts and supporters. The above netting should be supported on 5 no. line wires the top 3 no. to be plastic-coated galvanised core 4.75mm/3.55mm gauge straining wires, and the bottom two-line wires should be 4m-diameter galvanised multi-strand straining wires are to be used. Netting to be attached to the straining wires by a suitable, secure and safe method of tying or clipping, 5 no. per line per metre. All track-side netting to be fitted on inner face of posts. Site boundary fencing should be fixed on the outside of the posts.

Corner, gate and straining posts to be a minimum RHS posts 60mm x 60m x 3.0mm RHS with steel base plates. Intermediate posts to be RHS posts 50mm x 50mm x 3.0mm also with steel base plates. All posts should be set in concrete of 760mm minimum depth.

It should be noted that even with strict supervision of the installation, chainlink fencing is prone to distortion by people resting against the fence or by ball impact.

b) Weldmesh rolls

Corner posts and strainer posts to be 60mm x 60mm x 3mm RHS complete with 2No full-height diagonal struts each with a single cross stay. All intermediate posts to be 50mm x 50mm x 3mm RHS. All posts to be set in concrete of 760mm minimum depth and 450 x 450mm on plan.

All support steelwork to be hot-dip galvanised. Fencing to be fixed to inside edge and consist of 50mm x 50mm x 3mm galvanised weldmesh. Mesh to be supported on 5No high-tensile line wires secured with stainless-steel anchor clips, 5 No. per line per metre

c) Weldmesh panels and proprietary systems

For weldmesh panels, supports as above but minimum panel thickness will be 4mm and panels usually powder-coated.

Manufacturers' specifications should be consulted for proprietary systems.

1.13.1.4 Gates

All gates should open outwards for the safety of athletes.

Single gates to be 1.2m wide by 2.05m high with lintel panel above.

Double gates to be 3.0m wide by 2.5m high with removable lintel panel above for ease of access with soccer goals. All gates to be fully infilled with chainlink or weldmesh and provided with a suitable locking mechanism. Hanging and clapping posts should be 60mm x 60mm x 3mm RHS with side struts.

All fixing bolts should be assembled with heads inside and bolts trimmed to within 6mm of the nut. Trimmed ends should be burred and treated.

1.13.2 External Trackside Fence

A 1.20m-high pedestrian barrier erected externally around the track, parallel to the outside kerb line, provides further security to the athletes and gives spectators a leaning rail at trackside.

This fence should not be located closer than 1.00m to the outside of the external kerb line (see Section 1.1.5).

A suitable barrier may be constructed from 2.0m-wide prefabricated galvanised steel panels consisting of a frame fabricated from 50mm x 30mm RHS with galvanised steel in-fill bars of 12mm diameter (see Fig 16). Adjacent panels are bolted together using 2No M10 x 75mm galvanised nuts, bolts and washers.

Support legs should be set in concrete to a minimum thickness of 150mm on all sides.

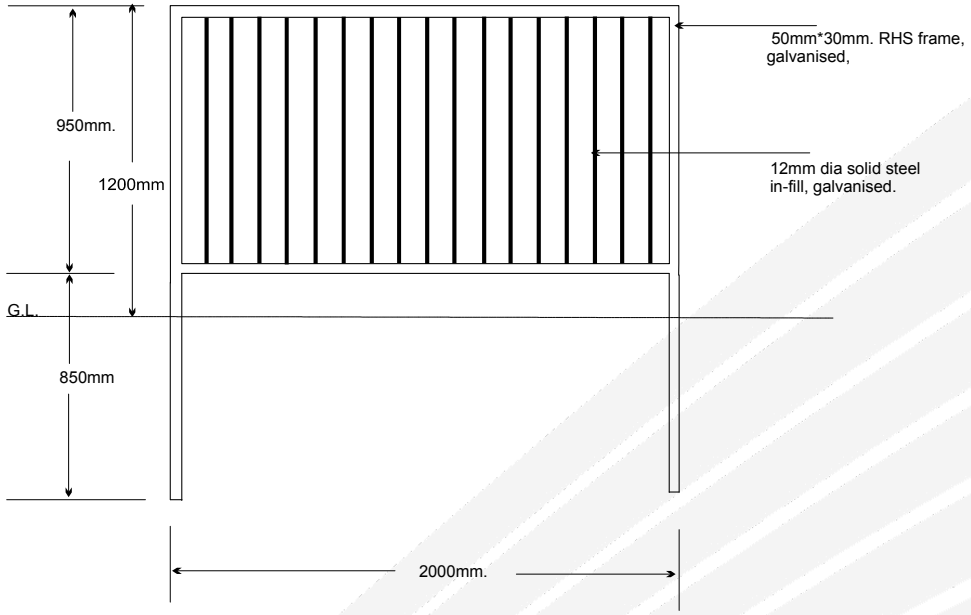


Figure 18 Pedestrian barrier detail

2 SECTION TWO: MAINTENANCE

2.1 Maintenance of Synthetic Surfaces

2.1.1 Introduction

By their nature, polymeric surfaces are extremely durable, being designed to satisfy arduous performance test criteria whilst withstanding constant spike use in climates varying from the Arctic to the Equator.

However, there is no such thing as a 'maintenance free' sports surface and all polymeric track surfaces will require a modest degree of maintenance. The basic maintenance is of vital importance if the surface is to remain good to look at, consistent in performance, safe for the athlete to run and jump on and long lasting. Indeed the installer's guarantee will usually be conditional on the recommended maintenance requirements being carried out with reasonable diligence.

2.1.2 What maintenance and why

Maintenance procedures are designed to ensure that:

- The track surface is kept scrupulously clean
- The track surface is safe for all standards of user
- In the case of the porous system, the free drainage of surface water is maintained throughout the life of the track
- The facility looks attractive and well-kept at all times

These objectives are achieved by:

- Sweeping leaves and other detritus from the surface
- Washing the surface to remove contaminants such as grime, algae, moss, sand etc.
- Applying prophylactic treatments of moss-killer and/or algaecide
- Periodically removing weed growth from the perimeter kerb lines

2.1.3 Keeping the surface clean

Leaves, tree flowers, pine needles and other detritus should not be allowed to remain on the surface for any length of time. If this does happen, they rapidly rot down, forming a contaminated 'skin' on the surface and providing a growing medium for algae and moss. Tracks located adjacent to motorways and other busy roads, industrial sites and where tree deposits and bird droppings are likely are especially vulnerable.

A mechanical leaf-sweeper or vacuum cleaner is ideal for removing vegetable matter and other rubbish. Restricted areas may have to be undertaken by hand. The equipment should be well maintained and carefully operated to avoid contamination of, or physical damage to, the surface. Spillage of fuel or lubricating oil may damage the surface, so great care should

be taken to ensure that the equipment remains in good mechanical order. There are a small number of specialist cleaning machines on the market but it is essential to select one that has brushes without wire.

At least once a year it is advisable to wash the surface with high-pressure jetting apparatus. There are many varieties of high-pressure washer available for purchase or hire. These can range from a simple hand-held lance through to a tractor mounted version. The higher the capacity the machine, the quicker the operation will be completed. A high pressure scrubber, incorporating a vacuum, should, ideally, be used to clean the entire track and run ups about every two years.

Polymeric surfaces can withstand pressures up to 2000 p.s.i. without suffering damage to the structure. Many commercial washers allow for carefully metered quantities of detergent and fungal inhibitors to be added to the water. These chemicals will help to prevent moss and algae from invading the surface.

Table 2 Specimen maintenance schedule for a polymeric athletics track

Action	**Frequency**	**Cost (where applicable) ***
Use of sweeper to remove surface detritus	As required but at least every two weeks.	
Use of lance on H.P. washer, to clear sand, mud, etc. from runways	As required, after use	
Use of H.P. scrubber for complete deep-clean of track and runways	At least every two years	£1.00 - £1.50 per s.m.
Re-texturing of heavily worn areas.	As they occur	£15 per s.m. (porous systems) £20 per s.m. (impervious sys.)
Centre area grass cutting (cuttings to be boxed)	As required	
Re-lining	As required	£6,500 - £7,500 (dependant on No. of lanes)
Cleaning of drains	At least once per year or more often if required.	
Repainting of lines	As required	£3,500

Table 2 Maintenance schedule for a polymeric athletic track

* 2004 prices

In the case of porous systems, it is advisable to retexture lanes 1 and 2 and areas of heavy wear, such as sprint starts, after 5 years of use. Deep cleaning should always precede retexturing. The cost of retexturing is shown in the above table. Complete retexturing may

not be essential but worn areas must be dealt with. However, if the black mat is showing through before five years, then the track owner should be claiming against the guarantee. Contractors may argue over the degree of use of a porous track and owners are advised to record usage. 95% of use of tracks is for training purposes. Excessive use of inside lanes and home straight indicates poor track management. (see below)

A revenue budget should be established by the operator to cover all of the above issues. In the event that the track is maintained to the standards shown above and is sensibly managed (see below) at least 10 years will pass before full retexturing is necessary. A separate account should be established to cover this. At 2004 prices, full porous tracks would cost around £10 per m2 to retexture and impervious systems about £16 per m^2.

There may be benefits in terms of savings in entering into a long term contract with specialist track cleaners to carry out the deep cleaning requirements.

The frequencies shown in Table 2 are the minimum required to maintain the life of the track surface for about 10 years. Regular surface inspections should take place and the frequencies of maintenance increased accordingly. Failure to carry out basic maintenance and retexturing will shorten the life of the track and may well result in early replacement at approximately two and a half times of the cost of retexturing.

2.1.4 Access over the track

At all track venues, both pedestrians and maintenance machinery require regular access to the central grassed area.

It is essential to provide protection for the track surface at regular pedestrian crossing points, e.g. from the dressing room on to a central pitch. This protection could take the form of roll-out matting to ensure that mud from football boots does not contaminate the track surface. When the central grassed area is being used for pitch sports, it is recommended that ball boys or girls wearing clean training shoes are used to retrieve the ball when it goes out of play. Players wearing boots will contaminate the surface with mud if they leave the grassed area to retrieve the ball.

It is wise to provide plywood or similar sheeting to allow access to the central area for grass cutting machines etc. The load imposed by such a machine must not exceed 1500kg, spread over four tyres.

Tracks should have a specially designated crossing point to allow heavy items of plant such as lorries, forklifts etc access to the central area. This extra loading is catered for by increasing the strength of the track base-works at the time of construction. Protection of the track surface is required at these locations.

Whenever small or large machines cross the track the demountable kerb must be removed at the appropriate position. The track manager should always brief visiting drivers of machines so they are fully aware of the procedure to be followed.

2.1.5 Spreading the wear

The inside lane(s) of a track, along with the start areas, horizontal and vertical jumps runways, are subjected to a massive amount of wear compared with the outside lanes of the circuit. For this reason, it will extend the useful life of the facility if athletes use these areas

as little as possible in training. This 'athlete management' can be achieved by such measures as:

- Coning or gating the inside lanes so that their use is restricted to competitions
- Spreading training use over both straights so that training for sprints and hurdles is spread evenly between the home and back straights
- Moving the high jump bed to different parts of the fan so that the athletes do not always take off from the same spot. Specialist high jumpers wearing 9mm spikes should, however, only take off from the specially strengthened area of the fan
- Using roll out run ups for the horizontal jumps
- Covering the take-off area in pole vault with suitable rubber for training

It is essential that spikes of the correct length should be used. These will not exceed 6mm except at the specially strengthened javelin and high jump areas where 9mm is permissible.

Although the polymeric materials are highly resistant to damage, point loads from sports equipment etc. should be avoided; otherwise localised damage to the track surface will occur.

2.1.6 Central Area

The regular maintenance of the central area, i.e. grass cutting, fertilising, weedkilling, etc., must be carried out with care and consideration of the synthetic track surface.

- All grass clippings should be boxed (collected) and removed from site
- Drift from sprayed fertiliser should not be allowed to reach the track
- The mowing machines should not be allowed to turn on the track surface
- The access route over the track and on to the synthetic surface should be clearly marked and some form of protection such as conveyor belting laid on the surface during access and egress.

2.2 Maintenance and Storage of Equipment

The life span of track and field facilities depends on regular maintenance. Lack of maintenance leads to deterioration and is costly to rectify. It projects a bad image and can result in overspending of annual budgets

Authorities responsible for annual budgets must make adequate provision for the cost of necessary maintenance which should include cleaning, renovation and replacement of worn out equipment.

All tracks must maintain an up-to-date Risk Assessment policy and maintenance manual which should be available for inspection if required. This should include evidence of regular staff training concerning the practical maintenance and upkeep of all equipment.

2.2.1 Track equipment

2.2.1.1 Track kerbing.

This should be checked regularly for damage. Plastic kerbing is susceptible to cracking as a result of UV light degradation. The sections that are removable for the high jump and steeplechase should have the fastenings and bolts lightly oiled if made from steel. If, when removed, brackets and pins are also removed, then care should be taken to ensure that no debris in the form of surface crumb etc. falls into the holes and hinders the replacement of kerbing. Kerbing when removed for this purpose should be placed so as not to cause a hazard to other users. The remaining kerbing should be visually checked to ensure that it is secure and undamaged. Any damaged joining brackets or kerbing should be repaired or exchanged at earliest opportunity.

It is a good policy to ensure that vehicles going onto the grass always enter and leave through a section where the kerb has been removed. This avoids damage to the kerbing by trucks and gang mowers.

2.2.1.2 Starting blocks.

These should have the foot plate surface checked. Replacement pads are available and are fitted by screws or by means of contact adhesive according to design. Check that all the fixing spikes are present and straight. Please note that research has shown that, for starting blocks, the ideal length of spike to ensure stability is 11mm. The use of 6mm or 7mm spikes is likely to result in the blocks slipping during use and thereby causing damage to the track. (These shorter spikes are suitable for shoes but not for starting blocks). Check foot plate fittings and lightly oil any moving parts.

2.2.1.3 Track judges, Timekeepers stands and Starters' stands.

These need little maintenance. Oil any wheels and check the metalwork and platforms – particularly the welding joins to ensure that stands are safe to use. If necessary repaint periodically.

2.2.1.4 Microphones, Amplifiers, Loudspeakers and Electrical Equipment.

Check cables for damage and charge batteries. Check that any underground photo-finish cables have watertight ends – any screw on caps should be greased or lightly oiled.

2.2.1.5 Hurdles.

Check regularly for splitting or damaged top boards. Plastic top boards whilst durable can be very dangerous to athletes if spikes leave a sharp spur on the upper surface. A little oil should be put on the bottoms or clips for height adjustment and on the sliding weights. Check that all weights have their mechanism for ease of movement and locking in place. The sliding tubes should be wiped with a lightly oiled cloth, or sprayed with Mr Sheen type polish.

2.2.1.6 Steeplechase Hurdles.

Check tops regularly for splinters or other damage – if damaged either replace or turn upside down until damage can be repaired. Ensure that legs are fixed securely to tops and are

vertical. If adjustable hurdles for height then ensure that mechanism for securing at correct height is working correctly. If there is an adjustable and moveable water jump, then periodically check that all parts are greased or lightly oiled and that any 'drop in' spacers are easy to put in and take out.

2.2.2 Equipment for Field Events

2.2.2.1 Pole Vault Landing Area.

Check that all fastenings are intact. Look at the clips and buckles, and especially make sure that the internal fastenings are secure and all the units are held firmly together. Does the wear sheet fit and is it fastened to the base units? Look for depressions in the foam – a sign that the foam is deteriorating. If using pallets, ensure that they do not protrude at any point and that the sides facing the vault are solid-faced so that a pole or athlete's foot cannot go under the pallet.

Take-off box. Keep box painted matt white to assist sighting. If the take-off box has drain holes, clear them out to assist drainage. Check that, if an insert piece is required at the front of the box, it fits securely prior to each use.

2.2.2.2 Stands

Check that nuts and bolts are tight and that stands are vertical when in use. Lightly oil the base carriage wheels and sliders. Check that the sliders have cast sleeves in them and that the castings are complete. Check the tension on the tape – this works on friction between pulleys and the tape. DO NOT oil the tape or winding mechanism since this will cause the tape to slip. If the winding handle slips, tighten the tension adjustment at the top of the stands by a quarter turn only and try again. Do not overtighten. If winding is tight, loosen the adjustment a quarter turn. If the tape 'grinds' on winding it is likely that the winch pulleys are damaged and the tape may break – usually this requires servicing by the manufacturer. Check that the base rails are not bent – lubricate with light oil and check that the bar support pegs are not bent or loose. Check that support arms are not loose and if there is vertical movement then adjust pulleys on outside of stand to restrict this movement.

2.2.2.3 Vaulting Poles

Check that glass fibre poles have a bung on the bottom and that it is not worn through. Check that the part of the pole (bottom 30 cm) likely to touch the back of the take-off box is protected with layers of tape. Check poles for deep scratches and cracks – these are likely to cause the pole to break and so injure the athlete. Check cross bars for splitting at the ends and in the centre.

2.2.2.4 High Jump Landing Area

Check that all fastenings are intact. Look at the clips and buckles, and especially make sure that the internal fastenings are secure and all the units are held firmly together. Does the wear sheet fit and is it fastened to the base units? Look for depressions in the foam – a sign that the foam is deteriorating. If using pallets, ensure that they do not protrude at any point and that the sides facing the jump are solid-faced so that an athlete's foot cannot go under the pallet.

2.2.2.5 Stands

Oil any wheels on the stands. Check the tightness of any bolts on the stand base and the uprights. Lightly oil the uprights or use Mr Sheen type polish. Oil the screw threads of the sliders and check that the bar-support is both tight and straight.

Cover. Oil the wheels, jacking points (if any) and the hinges. Check that any locking mechanism is working correctly.

2.2.2.6 Long Jump/Triple Jump.

Lift the take-off and blanking boards and oil or grease any adjusters in the trough (if any) and underneath the boards. If fitted ensure that any lateral movement adjusters are also oiled or greased. Check that no jump indicators fit securely and are not bent. Ensure that plasticine is complete and maintained in good condition. Remove any sand from underneath the no jump indicator. If necessary adjust the blanking and take-off boards level with surface of runway. Check periodically that surrounding turf does not encroach on to runways.

Sand. Check the sand for undesirable materials such as stones, paper, glass etc. If necessary dig over to a minimum depth of 300mm and rake level. Also check sufficient sand is present in the pits. Check the availability of a watering can. Dampen the head of wooden rakes before use. Periodically, if open to the elements and animals, it may be necessary to disinfect or change the sand.

2.2.2.7 Javelin.

Check for straightness, especially the tail end. Check that the grip cords are not frayed or unwinding (they can be glued with 'Copydex'). If possible check length, weight and centre of gravity because the tips wear due to ground conditions and alter the specifications. After use, wipe with a damp cloth to clean off dirt and finish with a dry cloth, particularly on the grip, if it is wet.

2.2.2.8 Shot.

Often new implements are covered with a glossy paint – to avoid possible damage to athlete's fingers due to the implement slipping the gloss should be rubbed off the surface. After use wipe over with a cloth to remove dirt, then wipe with a dry cloth. Check for correct weight, since shots do lose weight with use –particularly if ground is full of grit or stones.

2.2.2.9 Discus.

Wipe with a damp cloth after use to remove dirt and then with a dry cloth. Check the side plates for a flush and tight fit, and the rim for splits and deep dents. Damaged side plates should be replaced. If there is sufficient weight in the implement then dents in the rim may be filed or smoothed out – this however must be done in such a way as not to end up with a very flat section but must be evened out over a section of the rim. Centre plates, if fitted, may be removed and straightened if they become proud of the body. If the discus develops a 'rattling' noise it is necessary to take the implement apart and extend the spring inside.

2.2.2.10 Hammer.

Wipe with a damp cloth to remove mud (it may be necessary to use a brush to clean around the swivel) and then dry with a dry cloth. Check that the swivel is moving freely, oil it, and if stiff, use WD 40. If swivel can be depressed into the head and no resistance is felt, then swivel is damaged and should be replaced. If springy resistance can be felt then it is good. Check the wires are not damaged and badly bent. Check the handles for cracks (replace if damaged). Check overall weight of implements: the handles come in different weights so they may need changing to meet specification.

2.2.2.11 Discus/Hammer cages.

Grease hinges, oil pulleys and check hauling ropes for fraying. Check nets for holes and if it does not affect the overall strength then tie together. Ensure that there is sufficient netting steel or fibre at the bottom to fold over and seal the cage, particularly in a wind. Note: the netting of the cage should be hanging free and not tied back to the posts or gate uprights (Rules demand that the opening at the mouth of the cage is 6m).

Check movement, bolt holes and ease of movement of gates and lubricate any moving parts.

2.2.2.12 Scoreboards

Oil wheels if any, dry the shuttered number boards, and check they are working correctly. If they get water inside they stick. Check any welding joins for cracks.

2.2.2.13 Trolleys.

Oil wheels and swivels. Check any welding joins for cracks.

2.2.2.14 Scales.

For electronic scales keep battery charged. For balance scales check that there is a complete set of weights (especially small ones which should be kept in a box). Recalibrate annually or as necessary.

2.2.2.15 Measuring tapes.

Oil the spindle of the winding handle and check that the tape is not twisted. Check the zero end for wear. Periodically unwind completely and wipe clean with a damp cloth before drying.

2.2.2.16 Clocks

Check for working – replace battery annually. It might be necessary from time to time to re attach ‘hand’ to spindle.

2.2.2.17 Wind Gauges

Oil screws on the tripods (if made from steel) and check thread in under-body of gauge. Check that gauge works and that the annual calibration is still valid. Replace battery as necessary. If blades are touching the body then need to be replaced by the manufacturer.

2.2.2.18 Referee's Kit.

Check that all parts are present. Lightly oil the steel tape and micrometer gauge.

Sensible spares to stock:

- Hurdle top bars, clips and buttons
- Pole vault bar supports, runway castings, bar support castings (if appropriate)
- Long Jump plasticine and no-jump indicator boards
- Hammer wires of different lengths, handles of different lengths and weights to suit different heads
- Cages – cable ties to repair nets
- Cross Bars for High Jump and Pole Vault

2.2.3 Storage

2.2.3.1 Microphones etc

Wrapped up and in box on shelves out of harm's way. Cables to be coiled neatly. Keep dry.

2.2.3.2 Hurdles

On a trolley, or stacked normal way up in sets of 10

2.2.3.3 Steeplechase Hurdles

If it is impractical to take indoors after each use then they should be stored with feet off the grass and preferably on a small stand to avoid water damage.

2.2.3.4 Pole Vault Landing Area

Keep base units out of lying water – if possible on a base or pallets under a metal cover.

2.2.3.5 Pole Vault Uprights

If possible store upright. If not, then support at both ends and in the middle. If stored inside then store sections on their side with wear cover neatly rolled up. Periodically release slightly the tape tension.

2.2.3.6 Cross Bars

Store on hooks supported in the middle and at the ends or neatly on racks.

2.2.3.7 Vaulting Poles

Keep in the original cardboard tubes or in plastic water pipes. Store horizontal and supported at each end and in the middle.

2.2.3.8 High Jump Landing Area

Keep base units out of lying water – if possible on a base or pallets under a metal cover. If stored inside then store sections on their side with wear cover neatly rolled up.

2.2.3.9 Stands

Store upright. Alternatively store horizontally supported at ends and in the centre. It is acceptable to store on landing area under the metal cover if this is large enough.

2.2.3.10 Plasticine No-Jump Indicators.

(a) Plasticine should be in a sealed bag and kept reasonably warm (20□C).

(b) The bases should be stored upright if possible.

2.2.3.11 Rakes

Brush clean after use and store upright if possible.

2.2.3.12 Javelins

Keep upright – preferably in a rack with points resting on a soft surface (wood is acceptable). Do not use plain metal Terry Spring Clips as these damage the javelin paint. Keep javelins of the same weight together. The rack should be in a warm, dry area. Keep training and competition javelins separate.

2.2.3.13 Shots

Store in a warm dry place on a wooden rack if possible. Otherwise keep shot of the same weight together and clearly marked. Keep competition and training shots separate. (It is not easy to distinguish used training shots from competition shots without weighing and measuring).

2.2.3.14 Discus

Store in a warm dry place on a wooden rack if possible, preferably edge on, the wood will not damage the side plates. Keep discus of the same weight together. Keep training and competition implements separate

2.2.3.15 Hammers

Store in a warm dry place on a rack – hanging from handles to keep wires extended. Keep hammers of the same weight together and keep training and competition implements separate.

2.2.3.16 Scoreboards

Keep upright and assembled if possible, otherwise remove top from base and store upside down.

2.2.3.17 Measuring tapes

Store open-reel tapes on a hanging rack and cased tapes in a box with each length separate.

2.2.3.18 Clocks

Store assembled, if sufficient space, other wise store on a rack with clock faces to each other to avoid accidental damage.

2.2.3.19 Wind Gauges

Store in the original box.

2.2.3.20 Scales

Store in their original box – on work bench.

2.2.3.21 Referee's Kit

Keep in box in a secure place. Keep small weights in a small box.

Appendix 1

Equipment List for 8 lane Track

The list below is comprehensive but does include some items that are not essential. Clients intending to purchase equipment should consult UKA to decide which items are appropriate and which are unnecessary. At those venues where it is intended to host competitions under IAAF Rules, it may be necessary to provide equipment which as an IAAF product certificate. Please talk to UKA to determine whether or not this is the case.

Where it is intended to host competitions under UKA Rules (most tracks) all equipment used must conform to the UKA Rules for Competition in force at the time of the competition.

The outdoor list below is a comprehensive requirement for an eight lane track, however, the precise requirement for any facility will depend on the level of competition and training taking place on the track in question. In most cases the requirement is likely to be less than this total list.

8 sets competition starting blocks

8 sets training starting blocks

30 no spare starting block pins

20 no spare hurdle tops

2 no multi purpose trolleys

1 no. starting block trolley

2 sets of 8-relay batons (8 senior, 8 junior)

100 no. competition hurdles

50 no. training hurdles

8 pairs yellow/white umpires flags

8 no. lane markers boxes nos. 1 to 8

1 no. starter's rostrum

1 no. lap scoreboard & bell

1 no. 8 lane staggered start system

2 no. judges' stands

1 no. 9mm starting gun

4 no. boxes of ammunition

4 no. 30 hurdle trolleys

4 no. 4m steeplechase hurdles (adjustable height)

1 no. 5m steeplechase hurdle (adjustable height)

1 no. winners' rostrum

2 no. digital wind gauges

50 no. red/white marker cones

2 no. starters' clapperboards

1 no. hurdle height gauge

2 pairs finishing posts c/w sockets

6 no gym benches

2 sets x 8 lane marker boxes

Jumping equipment

5 pairs sighting boards

12 no. plasticine rolls

2 no. plasticine rollers

2 sets long jump/triple jump runway markers

2 pairs lifting hooks

4 no. wooden sandpit covers

2 no. sandpit spades

5 no. rakes

5 No brooms

2 no. sandpit shovels

5 no. galvanised watering can

2 no. set competition high jump stands

1 no. set training high jump stands

5 no. competition high jump crossbars

6 no. training high jump crossbars

2 no. flexibars

1 no. high jump landing area 5.00m x 3.00m x 0.65m minimum

1 no. high jump landing area platform

1 no. high jump wheel-away cover (galvanised steel)

1 no. high jump height gauge

2 set competition pole vault stands

1 set training pole vault stands

5 no. competition pole vault crossbars

5 no. training pole vault crossbars

2 no. flexibars

2 no. pole vault landing area 7.50m x 5.00m x 0.80m minimum

1 no. pole vault landing area platform

1 no. pole vault pole rack

10 no. vaulting poles – various
1 no. measuring device
1 no. metal landing area cover
3 no. windsocks on stands
1 pair bar lifters for pole vault
1 no. spare trough

Throwing equipment

Discus

10 no. 2kg competition discs
10 no. 1.75kg competition discs
10 no. 1.50kg competition discs
5 no. 1.25kg competition discs
10 no. 1.00kg competition discs
6 no. 0.75kg competition discs
8 no. 2kg training discs
8 no. 1.75kg training discs
8 no. 1.50kg training discs
8 no. 1.25kg training discs
12 no. 1.00kg training discs
8 no. 0.75kg training discs
12 no. wheel-away discus trolley
1 no. chalk bowl

Javelin

12 no. competition 800g javelins
6 no. competition 700g javelins
12 no. competition 600g javelins
6 no. competition 500g javelins
6 no. competition 400g javelins
12 no. training 800g javelins
6 no. training 700g javelins
12 no. training 600g javelins
6 no. training 500g javelins
6 no. training 400g javelins
1 no. wheelaway javelin stand

1 no. chalk bowl

Shot

10 no. 7.25kg competition shot

10 no. 6.00kg competition shot

10 no. 5.00kg competition shot

10 no. 4.00kg competition shot

5 no. 3.25kg competition shot

3 no. 3.00kg competition shot

8 no. 7.26kg training shot

6 no. 6.00kg training shot

6 no. 5.00kg training shot

8 no. 4.00kg training shot

6 no. 3.25kg training shot

3 no. 3.00kg training shot

2 no. wheelaway shot stands

9 pairs distance markers

2n0. spare stop boards

1 no. chalk bowl

Hammer

1 no. hammer length gauge

8 no. 7.26kg competition hammers

10 no. 6.00kg competition hammers

10 no. 5.00kg competition hammers

10 no. 4.00kg competition hammers

5 no. 3.25kg competition hammers

10 no. 7.26kg training hammers

6 no. 6.00kg training hammers

6 no. 5.00kg training hammers

8 no. 4.00kg training hammers

6 no. 3.00kg training hammers

1 no. wheelaway hammer stand

10 no. spare wires

5 no. spare handles

10 no. special weight hammers

10 no. chain hammers

10 no. 1kg training hammers
10 pairs red/white judges flags
5 no. wheelaway scoreboards
3 no. warning horns
100 no. pig tail stakes
3 no. 220m reels of 8mm polypropylene rope
4 no. brooms
6 pairs distance marker boxes for jav./discus/hammer
2 no. loud hailers
1 no. concentric circle inset

Measuring equipment

1 no. referee's kit
10 no. measuring spikes
3 no. 100m fibreglass tapes
4 no. 50m fibreglass tapes
4 no. 30m fibreglass tapes
4 no. 20m fibreglass tapes
1 no. 20m steel tape
1 no. 30m steel tape

Miscellaneous

Field Event Scoreboards x 6
Chalk
Red white flags x 10 sets
Green flags x 4
Time elapsed clock x 4
Multi markers x 1 set
Automatic timing system

Appendix 2

Track Markings

	General:
	Lane Lines
	Finish Line
	Photo finish grid
	Break line
	Lane numerals (start and finish sprint straight)
	Start lines for:
	50M (schools) *
	60M (schools) *
	70M (schools) *
	75M
	80M
	100M
	110M
	Staggered start lines for:
	150m *
	200M
	300M
	400M
	800M
	Curved starts lines for:
	800M
	1,000M
	1,500M
	1 Mile (include 440y, 880y, 1320y marks on inside of kerb)
	1,500M Steeplechase
	2,000M Steeplechase
	3,000M Steeplechase
	3,000M
	5,000M
	10,000M
	Hurdle Position marker lines for:
	60M *
	70M *
	75M
	80M
	100M
	110M
	400M
	Steeplechase
	Relay zones and acceleration marks for:
	4x100M Relay
	4x400M Relay

These markings represent the total recommendation for UK Athletics competition but the individual user groups should be consulted with regard to the need for the events marked *

The marking for the barriers are the same for all steeplechase events but their precise location will depend on whether the water jump is located inside or outside the track.

The detail of all markings can be found in the current copy of UK Athletics rules for competition.